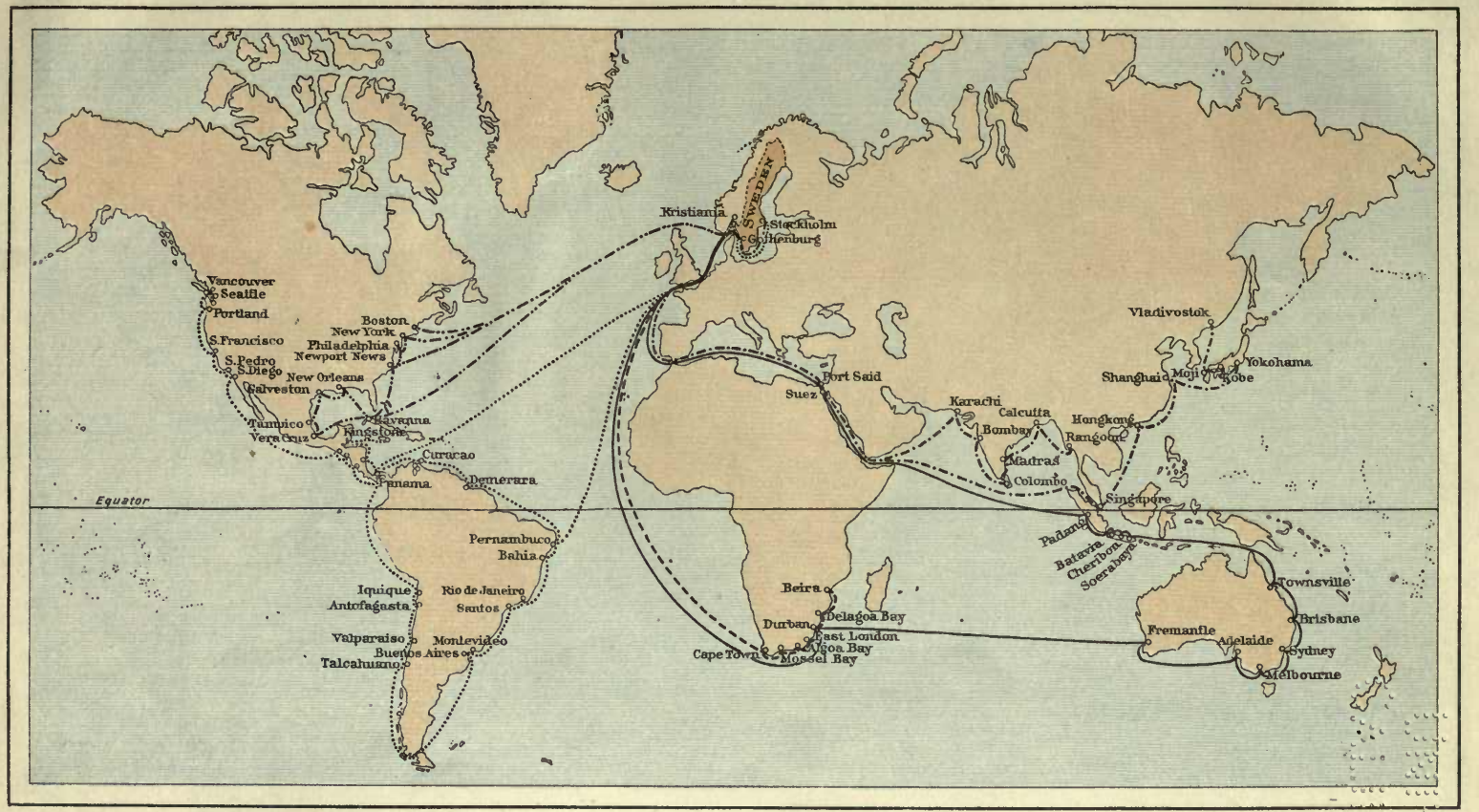
PANAMA PACIFIC INTERNATIONAL EXPOSITION SAN FRANCISCO 1915

SWEDEN

OFFICIAL CATALOGUE



GEN. STAB. LIT. ANST. STHLM.

Sweden—Mexico

Sweden—Brazil—La Plata

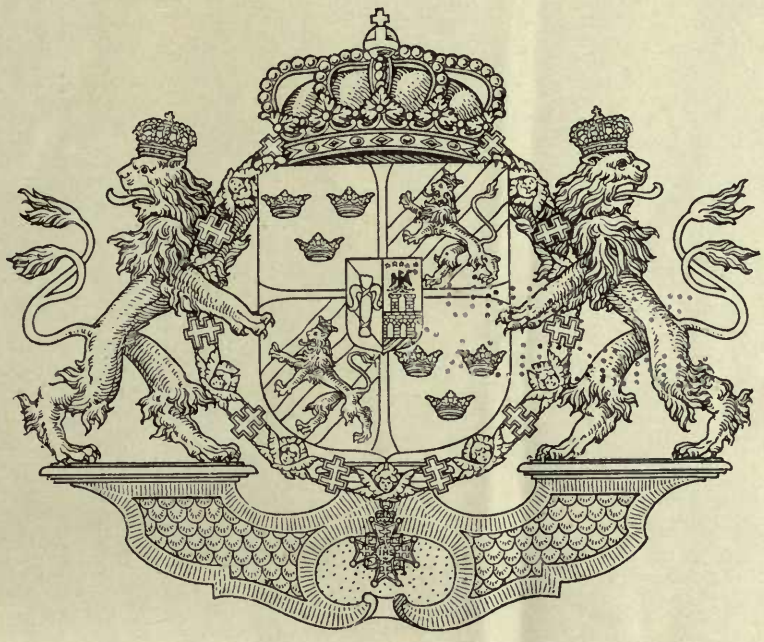
Sweden—South-Africa

Sweden—Straits—China—Japan

Sweden—Australia

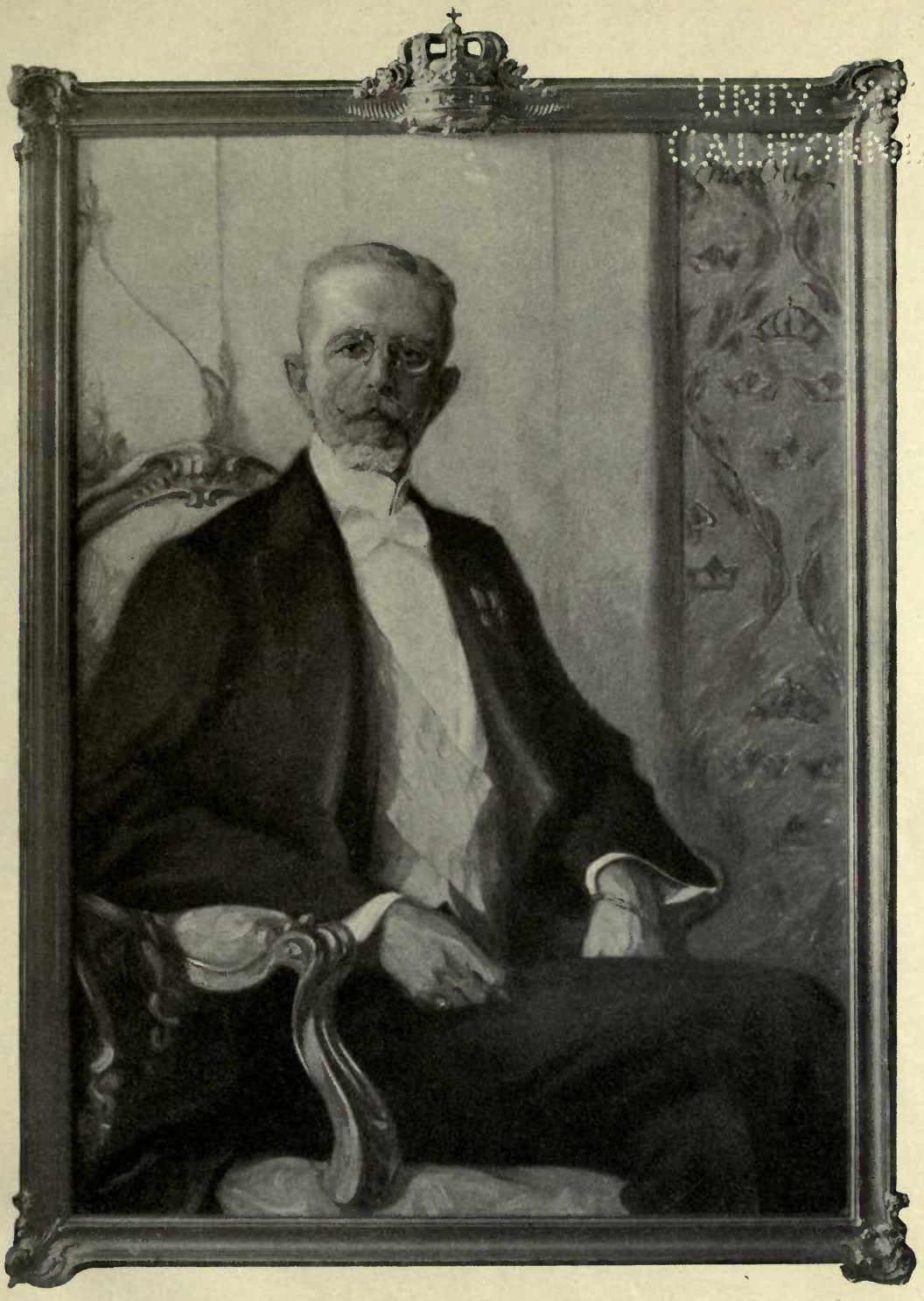
Gen. Stab. Lit. Anst. Stkm.

OFFICIAL SWEDISH CATALOGUE



PANAMA-PACIFIC INTERNATIONAL EXPOSITION
SAN FRANCISCO 1915

CENTRALTRYCKERIET, STOCKHOLM 1915



H. M. GUSTAF V

KING OF SWEDEN

OIL-PAINTING BY MR H. MASOLLE.
IN THE SOCIAL ROOMS OF THE SWEDISH BUILDING.

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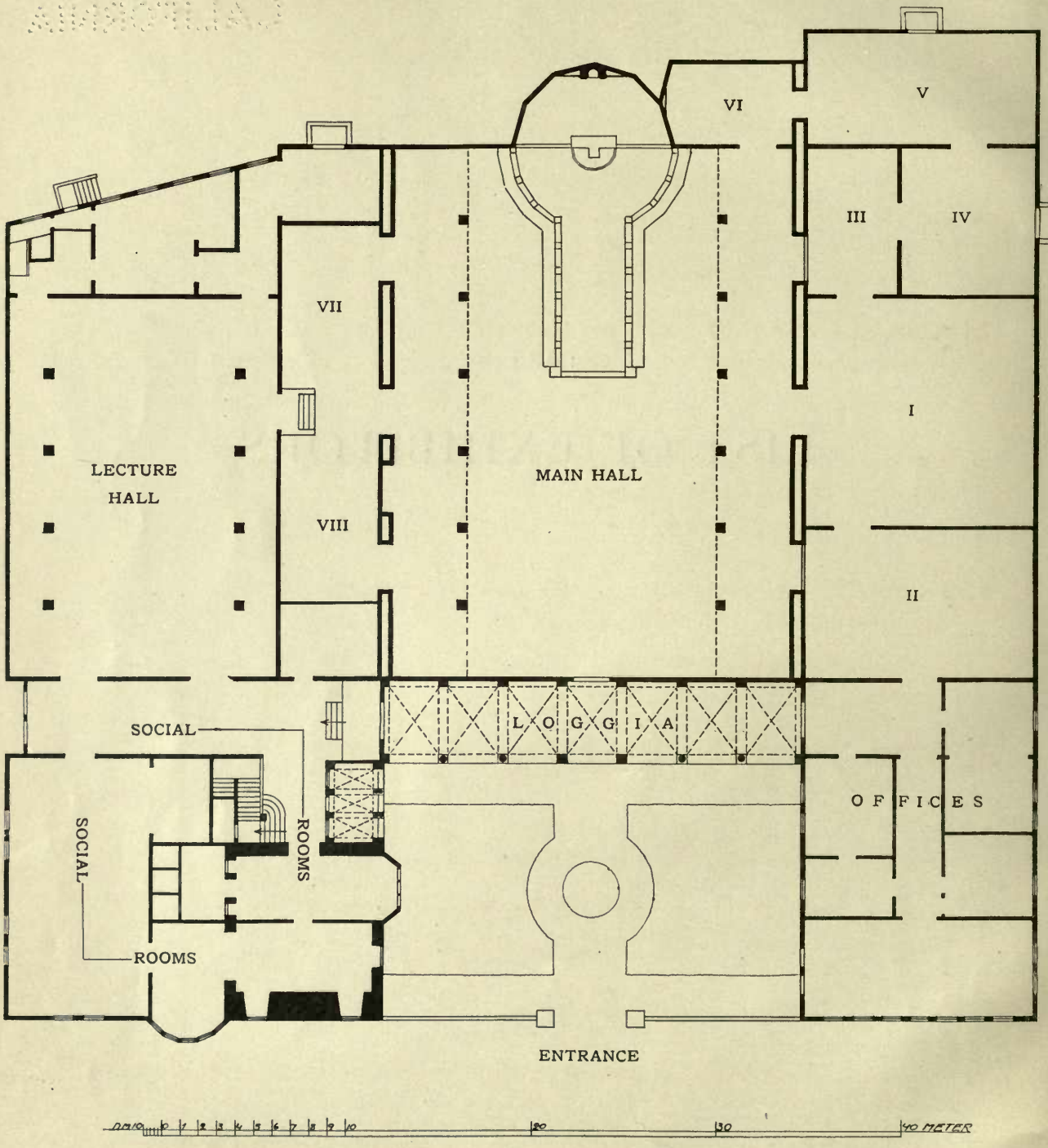


THE MAIN HALL.

1. Stockholm — »The City».

Decorative painting showing the old part of the Capital of Sweden — »Staden inom broarna» (The Town between the Bridges).

Executed according to the directions of Mr. F. Boberg, architect, of Stockholm, by Mr. O. Brandtberg, artist.

2. Nobelstiftelsen, Stockholm, Sweden.
The Nobel Foundation.

Established in 1896 by means of a legacy from Dr. Alfred Nobel.

3. Kungl. Telegrafstyrelsen, Stockholm, Sweden.
The Royal Telegraph Department.

Established in 1856.

4. Kungl. Järnvägsstyrelsen, Stockholm, Sweden.
The Royal Government Railroad Department.

Established in 1855.
See page 111 Part II and page 161 Part III of this catalogue.

5. Kungl. Vattenfallsstyrelsen, Stockholm, Sweden.
The Royal Board of Waterfalls.

Established in 1909.
See page 162 Part III of this catalogue.

6. Kungl. Lotsstyrelsen, Stockholm, Sweden.
The Royal Pilotage Board.

The Pilot service was established by the Government in 1654. The functions of the Board are regulated by an Act of 1898.

7. Svenska Aktiebolaget Gasaccumulator, Stockholm, Sweden.
The Gasaccumulator Co., Ltd.

Manufacturers of the AGA apparatus for navigation, railroad and military lighting or signalling purposes.

American patents and rights owned by:
American Gasaccumulator Co., Perry Bldg. Philadelphia, Pa, and Commercial Acetylene Railway Light & Signal Co., 80 Broadway, New-York.
See page 189 Part III of this catalogue

8. Aktiebolaget L. M. Ericsson & Co., Stockholm, Sweden.
L. M. Ericsson & Co., Ltd.

Manufacturers of Telegraph and Telephone apparatus, switchboards, assessories and scientific instruments.
See page 183 Part III of this catalogue.

9. Trafikaktiebolaget Grängesberg-Oxelösund, Stockholm, Sweden.
Luossavaara-Kiirunavaara A.-B.
Rederi A.-B. Luleå—Ofoten.
The Grängesberg-Oxelösund Traffic Co., Ltd.

Owning and operating the Gellivare, Kiiruna and Grängesberg mines, as well as railroads and steamship lines for the export of iron ore.
See also No. 22 and page 241 Part III of this catalogue.

10. Göteborgs Nya Verkstads Aktiebolag, Göteborg, Sweden.

Shipyard and engine works: »Götaverken», Gothenburg, Sweden.
Builders of every type of ship for the Navy and merchant services.

11. Aktiebolaget Svenska Ostasiatiska Kompaniet, Göteborg, Sweden.
The Swedish East-Asiatic Co., Ltd.

Fortnightly sailings via Suez to the Straits, China and Japan.
Monthly sailings via Suez to Karachi, Bombay, Colombo, Madras and Calcutta.
Agents in London: Escombe McGrath & Co.
Hamburg: L. Rudolphs.
Christiania: Fearnley & Eger.
See page 272 Part III of this catalogue.

12. Rederiaktiebolaget Transatlantic, Göteborg, Sweden.
The Transatlantic Steamship Co., Ltd.

Direct service Sweden-Australia, South Africa and Java.
Monthly sailings from Gothenburg. 11 steamers, in all 75,050 tons d. w.

13. Svenska Sällskapet för Räddning af Skeppsbrutna, Göteborg, Sweden.

The Swedish Society for the saving of life from Shipwreck.

Founded in 1907 for the purpose of establishing lifesaving-stations on the Swedish coasts. Membership invited.

See page 279 Part III of this catalogue.

14. A. F. Wiking, Stockholm, Sweden.

Mechanical Engineer and Shipbuilder.
Inventor of self-dumping barge.

15. Svenska Vattenkraftföreningen, Stockholm, Sweden.

The Swedish Water Power Society.

Society for the promotion of the proper utilization of water-power in Sweden.

16. Vattenbyggnadsbyrån, Stockholm, Sweden.

Bureau for Hydraulic Constructions.

Consulting engineers for hydraulic constructions; especially water-power plants.

See page 254 Part III of this catalogue.

17. Aktiebolaget Skånska Cementgjuteriet, Stockholm, Sweden.

The Skånska Cementgjuteriet Co., Ltd.

Engineers and Contractors for reinforced concrete buildings and constructions of every kind.

18. Aktiebolaget Arcus, Stockholm, Sweden.

The Arcus Co., Ltd.

Engineers and Contractors for reinforced concrete work.

19. A. W. Rahmn, Malmö, Sweden.

By special appointment Photographer to H. M. the King.
Portraits of the swedish Royal Family.

ROOM I.

21. Jernkontoret, Stockholm, Sweden.
The Jernkontoret.

An institution founded in 1747 for the promotion of the Swedish iron industry.
Exhibits model of electrical blast furnace; graphic tables illustrating ore-raising and iron-manufacture; models of the Falu and Dannemora mines.

22. Trafik A.-B. Grängesberg-Oxelösund, Stockholm, Sweden.
The Grängesberg-Oxelösund Traffic Co., Ltd.

Owning and operating the Gellivare, Kiiruna and Grängesberg mines, as well as railroads and steamship lines for the export of iron-ore.
See also No. 9 and page 241 Part III of this catalogue.

23. Larsbo-Norns Aktiebolag, Wikmanshyttan, Sweden.
The Wikmanshyttan Iron and Steel Works.

Manufacturers of Charcoal Pig Iron, Crucible Steel, Hammered, Rolled and Cold drawn steel, Steel Castings, Tool steel and High speed steel, Hammers and other tools.
See page 205 Part III of this catalogue.

24. Wirsbo Aktiebolag, Wirsbo Bruk, Sweden.
The Wirsbo Co., Ltd.

Founded in 1620 (Ramnäs Bruk).
Manufacturers of projectiles. High class chain cable. High grade steel. Bar Iron. All kinds of Ram-forgings. Rough bars etc.

25. Aktiebolaget Bofors-Gullspång and Aktiebolaget Bofors Nobel-krut, Bofors, Sweden.

Manufacturers of different kinds of war appliances, as Guns up to 30 cm., Howitzers, Armourplate, Projectiles, Fuzes, Powder, Steel Castings etc.

26. Sandvikens Jernverks Aktiebolag, Sandviken, Sweden.
The Sandvik Steel Works Co., Ltd.

Manufacturers of the celebrated Sandvik Charcoal-steel. Forges. Hot and Cold Rolling-Mills. Wire-Mills. Saw Factories.
See page 221 Part III of this catalogue.

27. Stora Kopparbergs Bergslags Aktiebolag, Falun, Sweden.
The Domnarfvet Steel Works.

A very old company, founded in 1225.

Manufacturers of Rolled and Hammered Steel in all usual sections for various purposes. High Grade Ferro Silicon. Steel Castings etc.

See page 234 Part III of this catalogue.

28. Söderfors Bruks Aktiebolag, Falun, Sweden.
The Söderfors Iron & Steel Works.

Manufacturers of Walloon Iron, Rolled & Hammered Swedish Charcoal Iron, Rolled & Hammered Tool Steel for various purposes, Anvils, Steel Castings etc. Made exclusively of the famous Dannemora raw-material.

29. Forsbacka Jernverks Aktiebolag, Forsbacka, Sweden.
The Forsbacka Iron Works Co., Ltd.

Brands: FJAB, F.E.R., A.M.C.

Production: 30,000 tons, consisting of High Class Steel, Hammered and Rolled, for all purposes. Hollow and Solid Tube-Steel. Tool Steel. Speciality: Hollow and Solid Drill-steel of highest quality, Round, Octagon, Hexagon, Cruciform and Spiral Steel of all usual sections.

See page 237 Part III of this catalogue.

30. Uddeholms Aktiebolag, Uddeholm, Sweden.
The Uddeholm Co., Ltd.

Manufacturers of Steel and Iron, Wire rods highest quality for Piano and rope-wire. Antimagnetic Iron. Cold Rolled Steel all descriptions. Band-saws. Drawn wire and sections. Horse-shoe nails. Wood screws etc.

See page 250 Part III of this catalogue.

31. Hofors Aktiebolag, Hofors, Sweden.
The Hofors Co., Ltd.

Manufacturers of Bessemer and Open Hearth Steel, highest qualities, Rolled, Pressed or Hammered. Specialities: hot rolled Rods and Strips, Hollow Drill Steel, Steel for Beam centres, Horse-shoes.

32. Aktiebolaget Österby Bruk, Dannemora, Sweden.
The Österby Iron and Steel Works Co., Ltd.

Manufacturers of Pig-Iron, Walloon bar-iron, Blister-steel, Crucible Steel of different kinds in ingots, billets and hammered bars, made from Dannemora ores.

See page 252 Part III of this catalogue.

33. Laxå Bruks Aktiebolag, Laxå, Sweden.
The Laxå Iron Works Co., Ltd.

Established in 1642.
Manufacturers of Swedish Charcoal Wrought Iron in blooms, rolled bars, nail and rivet rods.

34. Fagersta Bruks Aktiebolag, Fagersta, Sweden.
The Fagersta Steel Works Co., Ltd.

Manufacturers of Swedish Charcoal Steel in Ingots, Billets, Bars, rolled and hammered, Rods for Ropes, Pianostrings and Springs, Drill steel for Hand Drills and Drilling Machines, Pocketknife-steel etc. Alloy Steels f. i. Chrome-, Tungsten-, Nickel-, Vanadium Steel etc.
Representative: John H. Brewster, 30 East 42:d street, New York City.

35. Kohlswa Jernverks Aktiebolag, Kohlswa, Sweden.
The Kohlswa Iron Works Co., Ltd.

Principal owners of the Iron Works and mines at Dalkarlshyttan and Uttersberg.
Manufacturers of Steel Castings, Forgings, Shrapnels, Nail rods and Nail plate, rolled & hammered Mining steel, Anvils.

36. Hults Bruk, Åby, Sweden.
The Hult Iron Works.

Manufacturers of all kinds of Axes, Adzes and Hatchets.

37. Gullspångs Elektrokemiska Aktiebolag, Gullspång, Sweden.
The Gullspång Electrochemical Co., Ltd.

Makers of high-grade (electrically produced) Ferrosilicon 25—95 % Si.

38. Höganäs-Billesholms Aktiebolag, Höganäs, Sweden.
The Höganäs-Billesholms Co., Ltd.

Coal Mine Proprietors. Manufacturers of Fire Bricks, Glazed Sanitary Pipes, Paving Bricks, and Clay Goods of every description. Carbon Electrodes and Iron Sponge.

39. Aktiebolaget C. E. Johansson, Eskilstuna, Sweden.

Manufacturers of Standard Combination Gauges.
See page 203 Part III of this catalogue.

40. A.-B. Alfr. Wesströms Verktygsfabrik, Rotebro, Sweden.
Alfr. Wesström Tool Manufacturing Co., Ltd.

Manufacturers of Tools, Cutters, Twistdrills, Taps and Dies. Cutters for wood-working machinery. Knives for beet sugar machinery.

41. Aktiebolaget Alpha, Stockholm, Sweden.
The Alpha Manufacturing Co., Ltd.

Manufacturers of Machines for Testing Materials.

ROOM II.

51. Husqvarna Vapenfabriks Aktiebolag, Husqvarna, Sweden.

Established in 1680.
Manufacturers of general foundry goods, sewing machines, bicycles, shot guns. Export to every part of the world. Manufacturers of »Superior» mincing machines as a speciality for U. S. A.
See page 200 Part III of this catalogue.

52. Nya Aktiebolaget Atlas, Stockholm, Sweden.

Established in 1873.
Manufacturers of rock drills, pneumatic tools for shipyards, machine shops, foundries etc.; air compressors; crude oil engines and oil-motor-driven pumps.
See page 117 Part III of this catalogue.

53. Allmänna Svenska Elektriska Aktiebolaget, Västerås, Sweden.
The Swedish General Electric Co., Ltd.

Manufacturers of electric machinery, lifts, cranes, winches, traverses, locomotives, motorcars etc. Canadian offices at Toronto.
See page 166 Part III of this catalogue.

54. Aktiebolaget Svenska Kullagerfabriken, Göteborg, Sweden.
The S. K. F. Ball Bearing Co., Ltd.

Manufacturers of double-row, self-aligning S. K. F. Ball Bearings.
New York office: S. K. F. Ball Bearing Co., 50 Church Str.

55. Ludwigsbergs Verkstads Aktiebolag, Stockholm, Sweden.
The Ludwigsberg Mechanical Works Co., Ltd.

Manufacturers of centrifugal and plunger pumps, high pressure air compres-

sors, steam turbines, steam and motor fire-engines, ice and refrigerator machinery.

See page 208 Part III of this catalogue.

56. Aktiebolaget Lux, Stockholm, Sweden.
The Lux Co., Ltd.

Manufacturers of the »Lux» incandescent kerosene oil vapor lamps, stoves, blow- and soldering lamps, portable suction cleaners, thermostatic valves etc.

See page 212 Part III of this catalogue.

57. Aktiebolaget De Lavals Ångturbin, Stockholm, Sweden.
The De Laval Steam Turbine Co., Ltd.

Manufacturers of Laval single-stage and multi-stage steam turbines, »Zeta» centrifugal pumps, fans and compressors.

See page 179 Part III of this catalogue.

58. Svenska Turbinfabriks A.-B. Ljungström, Finspong, Sweden.
The Swedish Ljungström Turbine Co., Ltd.

Manufacturers of steam turbines and turbine generators under the Ljungström patents.

See page 230 Part III of this catalogue.

59. Aktiebolaget B. A. Hjorth & Co., Stockholm, Sweden.
B. A. Hjorth & Co., Ltd.

Manufacturers of »Primus» wickless coal oil (kerosene) cooking stoves, soldering lamps and heating apparatus, »Vanc» 2-cycle crude oil engines, »Primus» cream separators, »Bahco» tools and »Bahco» electric drilling and grinding machines.

See also No. 94 and page 197 Part III of this catalogue.

60. Nya Aktiebolaget Stathmos, Nynäshamn, Sweden.
The Stathmos Engineering Co., Ltd., Nynäshamn, near Stockholm.

Manufacturers of all kinds of scales and saw-mill machinery.

See page 232 Part III of this catalogue.

61. A.-B. Per Perssons Väf- & Stickmaskin, Stockholm, Sweden.

Sole makers of Universal Knitting-machines (Perssons) under Swedish, Continental and U. S. Patents. Faultless Plain-, Rib-, Cardigan- and Fancy-knitting.

62. Aktiebolaget Ingeniörsfirma Fritz Egnell, Stockholm, Sweden.

Consulting Engineers. CO_2-Recorder »Mono» and »Mono System» for economical heating and saving of coal at boiler plants, brick-, cement- and blast-furnaces.

See page 180 Part III of this catalogue.

63. Fr. J. Berg, Kammakaregatan 19, Stockholm, Sweden.

Manufacturer of surveying instruments and magnetometers, system Thalén-Tiberg, Dahlblom, Thomson-Thalén.

64. Svenska Aktiebolaget Logg, Stockholm, Sweden.
The Swedish Log Co., Ltd.

Manufacturers of the SAL logs, recording automatically speed and distance at any place desired on board a ship.

See page 209 Part III of this catalogue.

65. Aktiebolaget Elektriska Ugnar, Stockholm, Sweden.

Agents for electric furnaces for steel smelting and general metallurgical purposes, built under the Rennerfelt patents.

66. Gustaf Johanson, Sundsvall, Sweden.

Inventor of the Automatic Recorder of wages and the Book-keeping machine.

67. Hjalmar Löfquist, Stockholm, Sweden.

Licensed electric light and power contractor. Manufacturer of electric radiators (U. S. Patent).

68. C. H. Hasselblad, Stockholm, Sweden.

Artificial hygienic sausage skins.

69. John Landin, Stockholm, Sweden.

Radium-Emanation Generators (Landin system) for the purpose of giving radio-active qualities to water.

70. Tip Top Patent Co., Stockholm, Sweden.

Manufacturers of the inventions of P. B. Härje.
Autodaters (Tip Top Kalender).

71. Carl H. Larsson, Vadstena, Sweden.

Inventor of Sowing-machine for garden use.

72. Svenska Uppfinnareföreningen, Stockholm, Sweden.
Swedish Inventors Association.

ROOM III.

75. Eskilstuna Jernmanufaktur Aktiebolag, Eskilstuna, Sweden.

Postal & Telegraphic Address: »Jernbolaget, Eskilstuna».
Owners of the Tunafors Factories.
Manufacturers of Table Cutlery, Cooks' and Butchers' Knives, Steels, Shears and Scissors, Small Iron Castings, Butts and Hinges etc.

76. Låsfabriksaktiebolaget, Eskilstuna, Sweden.

Manufacturers of Door-locks, Door-handles and all other kinds of Brass-goods for buildings, Door-checks, Padlocks, Till- and Chest-locks, Brasswork for Railway-carriages, Steam-and Motorboats.

77. B. & O. Libergs Fabriks A.-B., Rosenfors, Eskilstuna, Sweden.

Manufacturers of Cutting Tools, Planing Irons, Axes of various types, Skates — »Salchow Special».

78. C. O. Öberg & Co:s A. B., Eskilstuna, Sweden.

Manufacturers of all kinds of Files and Rasps of best quality and of Sand-blast-Files of superior edge and durability.

79. A.-B. P. Liljeqvists Sågblads- & Redskapsfabrik, Eskilstuna, Sweden.

Manufacturers of Circular-and other Saws, Machine-Knives, Spades, Shovels, Manure- and Hay-Forks, Garden Tools.

80. Erik Anton Berg, Eskilstuna, Sweden.

Manufacturer of Razors, Pliers, Chisels, Planing Irons, Shoemakers Knives, Sloyd (Carving) Knives etc.

81. Hadar Hallströms Kniffabriks A.-B., Eskilstuna, Sweden.

Manufacturers of all kinds of Pen and Pocket Knives, Sailors Knives, Pruning and Grafting Knives etc.

82. Aktiebolaget C. V. Heljestrand, Eskilstuna, Sweden.

Speciality: Razors of fine quality.
Manufacturers of Scissors, Tongs, Manicure Instruments, Corkscrews.

83. Emil Olsson, Eskilstuna, Sweden.

Manufacturer of high class Pen and Pocket Knives, etched and gilded Steel Articles.

84. F. E. Lindström, Eskilstuna, Sweden.

Speciality: The manufacture of Tongs.

85. Aktiebolaget Törnblom & Hedengran, Eskilstuna, Sweden.

Manufacturers of high class Pen and Pocket Knives, etched Steel Articles etc.

86. Eskilstuna Stålpressnings Aktiebolag, Eskilstuna, Sweden.

Postal and Telegraphic address: »Pressbolaget, Eskilstuna».
Stamping Works, Enamelling Works and Plate Rolling-Mills.
See page 187 Part III of this catalogue.

ROOM IV.

91. Aktiebolaget Separator, Stockholm, Sweden.

Manufacturers of Cream- and Yeast Separators, Churns and Milk Testers.
See page 163 Part III of this catalogue.

92. Svenska Centrifugaktiebolaget, Södertelje, Sweden.

Manufacturers of the Dalia and Angelus Cream Separators.

93. Aktiebolaget Rotator, Södertelje, Sweden.

Manufacturers of the Globe and Sylvia Cream Separators.

94. A.-B. B. A. Hjorth & Co., Stockholm, Sweden.

Manufacturers of the Primus Separator.
See also No 59 and page 197 Part III of this catalogue.

95. Nickels & Todsen, Stockholm, Sweden.

Sole exporters of the Upsala and Tor Cream Separators, and the Robur and Drott crude oil engines.

See page 213 Part III of this catalogue.

96. Aktiebolaget Mjölkningsmaskinen Omega, Flen, Sweden.
The Omega Milking Machine Co., Ltd.

Manufacturers of the Omega Milking Machine. A hygienic Vacuum Milking Machine.

97. Mjölkningsmaskinen Comor, Stockholm, Sweden.
The Comor Milking Machine.

Manufacturers of the »Comor». A hygienic Milking Machine on the »suction and pressure» principle.

See page 279 Part III of this catalogue.

98. Allmänna Svenska Utsädesaktiebolaget, Svalöf, Sweden.
The General Swedish Seed Company.

Cultivation and sale of Svalöf Original Seeds under the special control of the Swedish Government.

99. W. Weibull, Landskrona, Sweden.

Improvement of agricultural plants (Roots, Cereals, Clover grasses and other forage plants) and vegetables, according to modern scientific methods (pedigree culture, crossing, mendelian analysis). Experimental farm: Weibullsholm at Landskrona, 1000 acres.

ROOM V.

101. Svenska Sockerfabriks Aktiebolaget, Stockholm, Sweden.
The Swedish Sugar Manufacturing Co., Ltd.

Operating 7 Refineries and 18 Raw-Sugar plants.

102. Svenska Pappersbruksföreningen, Stockholm, Sweden.
The Association of Swedish Paper Mills.

An Association comprising a great number of the most prominent Swedish Paper Mills.

103. A.-B. Karlstads Mekaniska Verkstad, Karlstad, Sweden.

Manufacturers of complete installations for Paper-, Sulphate- and Sulphite-Mills and Wood-pulp Machinery.

104. Svenska Trävaru-Export Föreningen, Stockholm, Sweden.
The Swedish Wood Export Association.

An Association comprising a great number of the largest saw-mill and lumber exporting concerns in Sweden.

105. Jönköping & Vulcans Tändsticksfabriks A.-B. Jönköping, Sweden.
The Jönköping and Vulcan Match Mfg. Co., Ltd.

Manufacturers of all kinds of Wooden Matches.
General Agents for Export beyond Europe:
Trummer & Co., Succ:rs, London, 4 Fenchurch Av., E. C.
Hamburg, Barkhof, Haus 2, III.
Theodor Winckler, Hamburg 8, Hopfensack 19, Hopfenburg.

106. Aktiebolaget Förenade Svenska Tändsticksfabriker, Stockholm, Sweden.
The United Swedish Match Mfg. Co:s., Ltd.

Manufacturers of all kinds of Wooden Matches, Operating 11 Match Factories.
See page 188 Part III of this catalogue.

107. Ljusne-Woxna Aktiebolag, Ljusne, Sweden.
The Ljusne-Woxna Co., Ltd.

Manufacturers of Swedish Charcoal-Iron, Rough Bars, Electric Steel, Diesel Engines, Motor Boats, Saw-mill Goods, Swedish Tar, Turpentine, Wood Alcohol, Acetate of Lime.
See page 206 Part III of ihis catalogue.

108. Statens Skogsförsöksanstalt, Stockholm, Sweden.
The Government Forest Experimental Institute.

Established in 1902 for the purpose of furthering the rational care and valuation of forests and for researches in forest botany, forest entomology and for the study of the soil.

109. Västernorrlands Läns Skogsvårdsstyrelse, Sollefteå, Sweden.
The Forest Conservation Board of the Province of Västernorrland.

Official Board for the promotion and protection of the regrowth of forests and for the control of the observance of legislation in regard to forests.

ROOM VI.

Graphical and statistical tables and models, demonstrating the most important facts regarding the economical life of the Kingdom of Sweden.

Exhibitors:

110. **The Swedish Government** by:

Kungl. Kommerskollegium.
The Royal Commerce and Industry Departement.

Kungl. Försäkringsinspektionen.
The Royal Insurance Inspection Board.

111. **Svenska Bankföreningen.**
The Swedish Banks' Association.

ROOM VII.

Models showing a modern Swedish gymnastic hall, the Stockholm Stadium etc. Photographs illustrating Swedish gymnastics and sports.

Exhibitors:

112. **Sveriges Centralförening för Idrottens Främjande.**
The Central Association of Sweden for the Promotion of Sports.

113. **O. Halldin, Stockholm, Sweden.**

Photographer. By Special Appointement to H. R. H. the Crown Prince.

ROOM VIII.

Models, statistics and photographs showing social work and social development in Sweden.

Exhibitors:

114. **The Swedish Government** by:

Riksförsäkringsanstalten.
The State Insurance Department (Accident Insurance).

Kungl. Pensionsstyrelsen.
The Royal Old Age and Disablement Insurance Department.

Kungl. Socialstyrelsen.
The Royal Labor Department.

115. Centralförbundet för Socialt Arbete.
The Central League for Social work.

In cooperation with private social workers.

116. Svenska Egnahemsbyrån, Birgerjarlsgatan 29, Stockholm, Sweden.
The Swedish »Own Homes» bureau.

Will give free of charge, assistance and advice regarding the purchase of homesteads and dwellings in all parts of Sweden; also regarding State-loans, citizenship, military service duty and other legal questions.

THE LECTURE HALL.

A collection of photographs illustrating town and country in Sweden. Swedish national costumes.

Exhibitors:

117. Turisttrafikförbundet, Stockholm, Sweden.
The Tourist Traffic Association.

Founded in 1902, with the view of benefiting tourist interests in Sweden. This Association endeavours to achieve its object by means of annual publications, distributed through agencies in Europe and America and has established tourist offices in Berlin and Paris.

118. Bikupan, 21 Klarabergsgatan, Stockholm, Sweden.
The »Beehive».

Handmade national costumes, Swedish embroidery, laces etc.

THE SOCIAL HALL.

Exhibition of Swedish Domestic Industry and Art Needle Work.

Exhibitors:

The State Union of Swedish Domestic Industry Associations through Miss L. Möller, Malmö, by the following members:

119. The Domestic Industry Association of Westerbottens Län, Umeå, Sweden.

120. The Domestic Industry Association of Ångermanlands Län, Sollefteå, Sweden.

121. The Domestic Industry Association of Värmlands Län, Karlstad, Sweden.

122. The Sloyd Association of Jämtland, Östersund, Sweden.

123. The Sloyd Association of Härjedalen, Sveg, Sweden.

124. The Domestic Industry Association of Upper Hälsingland, Hudiksvall, Sweden.

125. The Domestic Industry Association of Bollnäs, Bollnäs, Sweden.

126. The Domestic Industry Association of Gestrikland, Gefle, Sweden.

127. The Domestic Industry Association of Jönköping, Jönköping, Sweden.

128. The Domestic Industry Association of North Kalmar Län, Vestervik, Sweden.

129. The Domestic Industry Association of South Kalmar Län, Kalmar, Sweden.

130. The Sloyd Association of Halland, Laholm, Sweden.

131. The Domestic Industry Association of Malmöhus Län, Malmö, Sweden.

Other exhibitors are:

132. Blekinge Läns Kungl. Hushållningssällskaps Slöjdmagasin, Karlskrona, Sweden.

133. Östergötlands Län. Laces from Vadstena by Mrs. Ingeborg Petrelli.

134. Kristianstads Län. Laces by Miss Augustine Ehrenswärd, Tosterup, Svenstorp, Sweden.

135. Tage Zickerman, Wittsjö, Sweden.
Handturned-Faiances.

136. The Domestic Industry Association of Medelpad, Sundsvall, Sweden.

137. Mrs. Thora Kulle, Lund, Sweden.

138. The Misses Svensson, Lund, Sweden.

139. Mrs. Bengta Eskilsson, Lund, Sweden.

140. Mrs. Nordenfelt, Höganäs, Sweden.

THE SOCIAL ROOMS.

Everything in these rooms has been manufactured in Sweden with the exception of rugs, which have been lent by Messrs Myrstedt & Stern, Ltd., Stockholm.

— **H. Mas-Olle, Stockholm, Sweden.**

Painting in oil: Portrait of H. M. GUSTAF V.

141. Anders Zorn, Mora, Dalarna, Sweden.

By the courtesy of Mr. Th. Laurin, Stockholm.
Etchings.

142. F. Boberg, Stockholm, Sweden.

Member of the Royal Academy of Fine Arts, Architect and Artist.
Etchings.

143. G. Kallstenius, Stockholm, Sweden.

Professor at the Royal Academy of Fine Arts.
Paintings in oil.

144. A. L. Schultzberg, Falun, Sweden.

Member of the Royal Academy of Fine Arts.
Paintings in oil.

145. A.-B. De Svenska Kristallglasbruken, Stockholm, Sweden.

(The Kosta Factory, established in 1741, The Rejmyre Factory, established in 1808. Eda and several other glass-works.)
Manufacturers of Cut Glass, Rock Crystal and Full Crystal table glass.
Representative in U. S. A.: J. H. Venon, 104, 5:th Avenue, New York.

146. A.-B. Gustafsbergs Fabriks Intressenter, Gustafsberg, Sweden.

Established in 1827.
Manufacturers of Bone China- and Earthenware.
Represented by J. H. Venon, 104, 5th Avenue, New York.
See page 195 Part III of this catalogue.

147. Rörstrands Fabriks A.-B., Stockholm, Sweden.

Established in 1726.
Manufacturers of China- and Earthenware, Art-ware, Table-services, Majolica, Sanitary ware, Insulators, Stoves and Tiles.
See page 219 Part III of this catalogue.

148. C. G. Hallbergs Guldsmedsaktiebolag, Stockholm and Gothenburg, Sweden.

Jeweller, Gold- and Silversmith.
By Special Appointment to H. M. the King.

149. K. Anderson, Stockholm and Gothenburg, Sweden.

Jeweller, Gold- and Silversmith.
By Special Appointment to H. M. the King.

150. H. Bergmans Konstgjuteri A.-B., Stockholm, Sweden.
H. Bergman Art Foundry Co., Ltd.

Plastic Art Foundry.

151. Anderson & Lundgren, Malmö, Sweden.

Manufacturers of Electrical Fixtures, Urns, Vases, Flowerpots etc. of hammered copper. Exhibits composed by Frans Elmgren, Sculptor, Malmö.

152. G. Larson, Stockholm, Sweden.

Sculptor.

153. Svenska Slöjdföreningen, Stockholm, Sweden.
The Swedish Industrial Art Association.

Association formed to promote Swedish industrial art and sloyd. The Association publishes a quarterly Journal and patterns for furniture and other household articles, plans for dwelling houses etc. The Association acts as an agency between artists and the public.
Annual Fee Kr. 5.—. Outside Europe Kr. 7.—.

154. Gustaf Hedberg, Stockholm, Sweden.

Bookbinder.
By Special Appointment to H. M. the King.

155. Albert Bonnier, Publisher, Stockholm, Sweden.

Represented in U. S. A. by:
Albert Bonnier Publishing House, 561 Third Avenue, New York, City.
Importers of Scandinavian literature. Library Agents.
See page 273 Part III of this catalogue.

156. Nordisk Familjeboks Förlags A. B., Stockholm, Sweden.

Publishers of »Nordisk Familjebok», revised and enlarged edition of the swedish encyclopoedia, with numerous illustrations, maps and plans. 30 volumes. Up to the present 21 volumes have been completed.

157. A. Börtzells Tryckeri A.-B., Stockholm, Sweden.

Owners of:

Generalstabens Litografiska Anstalt.

Publishers and Printers, established in 1872.
Speciality: Official maps of Sweden.

The Office in the Swedish Building has been furnished by:

Åtvidabergs Förenade Industrier, Ltd., Åtvidaberg, Sweden.

Telegraphic Address: »Snickerifabriken, Åtvidaberg, Sweden».
Manufacturers of Office Furniture, Rolltop desks, Filing cabinets, Card index systems.

The Clock and Chimes in the Tower of the Swedish Building have been manufactured by:

G. W. Linderoth, Stockholm, Sweden.

Manufacturer of Tower Clocks, Station Clocks, Dials, etc.

The Fountain in the Courtyard has been manufactured by:

Svenska Granitindustriaktiebolaget, Sölvesborg & Stockholm, Sweden.

Sculptured granite, Building stone and Paving stone.

PART II.

GENERAL INFORMATION CONCERNING SWEDEN
MONOGRAPHIES
MONOGRAPHIES ON VARIOUS PHASES OF SWEDISH LIFE AND INDUSTRIES

THE ROYAL PALACE, STOCKHOLM.

GENERAL INFORMATION CONCERNING SWEDEN.

Geographical Situation and General Features.

The Scandinavian peninsula, which is bordered by the Arctic and Atlantic Oceans, the North Sea, the Skagerack and Cattegat, the Baltic and the Gulf of Bothnia and which is joined to the continent of Europe only in the North East, is divided into two kingdoms, Sweden and Norway. Sweden comprises the eastern and southern parts and has a superficial area of 447,864 square kilometres (170,713 English square miles) of which 36,852 square kilometres (13,900 English square miles) are covered by water. About one tenth of the whole of the country is more than 600 metres (abt. 1,900 English ft.) above the sea level, and barely a third is less than 100 metres (abt. 330 English ft.) above the sea level. The mountainous part of the country lies chiefly in the West and is formed by offshoots from the great mountain range of Kölen, which forms the border between Sweden and Norway. The Swedish highlands extend from the northern border down to the valley of the River Dal in the South, and slope downwards to the Gulf of Bothnia in the East. The highest peak in the whole of Sweden is situated in this mountain range; it is called Kebnekaise and is 2,123 metres (7,800 English ft.) high. To the South of the River Dal we have the central highlands of Sweden, which abound in minerals. Further South is an extensive plateau (Småland's highlands), which is almost separated from the other high-lying regions of the peninsula. The lowlands are found principally in the eastern and southern parts of the kingdom. A low-lying coast, of variable width, stretches along the Gulf of Bothnia. In the southern lowlands a few small peaks are to be found. To the South of Småland's highlands lies Skåne's fertile plain.

Sweden is richer in water-ways than most European countries, but in consequence of the mountainous character of the country the rivers cannot be rendered navigable to any great extent. The largest river, the Klarälfven (River Klar), which after flowing into Lake Väner, continues as the Göta älf (River Göta) is 703 kilometres (abt. 440 English miles) long. Among the extra-ordinarily numerous lakes, the following are the most important: Lake Väner (the third largest lake in Europe) with an area of 5,568 square kilometres (abt. 2,150 English square miles), Lake Vätter 1,899 square kilometres (733 English square miles), Lake Mälar, 1,163 square kilometres (449 English square miles) and Lake Hjälmar 480 square kilometres (185 English square miles).

Climate.

Sweden is situated between 55° 20′ and 69° 3′ N. latitude, and consequently, as the country stretches so far from North to South, the climate varies considerably. The climate in the South can be compared with that of central Europe, and even in the most northerly provinces the climate, in comparison with that of other countries in the same latitude, is mild.

Vegetation boundaries in the North:

Beech	to abt.	58°	N. lat.
Oak	"	61°	"
Hazel	"	62°	"
Fruit trees	"	65°	"
Spruce, fir and pine	"	68°	"
Birch	"	69°	"
Wheat	"	63°	"
Oats	"	65°	"
Barley	"	66°	"
Rye	"	67°	"

Mean temperature of various towns in Sweden.

Town	Latitude N.	Mean temperature Celsius Jan.	July	Annual
Haparanda	65° 50′	— 11.6	+ 15.1	+ 0.2
Härnösand	62° 38′	— 6.5	+ 15.3	+ 3.2
Gäfle	60° 40′	— 5.0	+ 16.3	+ 4.3
Stockholm	59° 21′	— 3.4	+ 17.1	+ 5.6
Wisby	57° 39′	— 0.8	+ 16.2	+ 6.5
Lund	55° 42′	— 1.3	+ 16.7	+ 7.0
Gothenburg	57° 42′	— 1.1	+ 16.7	+ 7.1

Area and Population.

For administrative purposes, Sweden is divided up into 24 counties, with the city of Stockholm as a separate administrative area. The following table shows the area and population of the various counties.

County		Size (land and water) sq. km.	Population 1/1 1914	Population per sq. km.	Principal town
Stockholm	(city)	113	382 085	3 698	—
"	(county)	7 763	222 046	29	Stockholm
Uppsala	"	5 313	130 404	25	Uppsala
Södermanland	"	6 811	182 180	27	Nyköping
Östergötland	"	11 049	298 488	27	Linköping
Jönköping	"	11 522	216 697	19	Jönköping
Kronoberg	"	9 910	157 560	16	Växjö
Kalmar	"	11 540	227 798	20	Kalmar
	Carry forward	64 021	1 817 258	—	—

	Brought forward	64 021	1 817 258	—	—
Gottland	(county)	3 160	55 422	18	Visby
Blekinge	"	3 015	150 049	50	Karlskrona
Kristianstad	"	6 456	232 734	36	Kristianstad
Malmöhus	"	4 833	469 377	97	Malmö
Halland	"	4 921	146 771	30	Halmstad
Göteborg o. Bohus	"	5 047	395 471	78	Göteborg
Älfsborg	"	12 729	291 330	23	Vänersborg
Skaraborg	"	8 480	240 667	28	Mariestad
Värmland	"	19 324	260 034	13	Karlstad
Örebro	"	9 134	210 666	23	Örebro
Västmanland	"	6 708	159 522	24	Västerås
Kopparberg	"	29 870	239 025	8	Falun
Gäfleborg	"	19 728	257 514	13	Gäfle
Västernorrland	"	25 533	256 666	10	Härnösand
Jämtland	"	51 556	121 400	2	Östersund
Västerbotten	"	58 934	166 107	3	Umeå
Norrbotten	"	105 520	168 870	2	Luleå
The four large lakes		9 122	—	—	—
	The Kingdom	448 091	5 638 583	13	

Stockholm is the capital of the kingdom. The administration of the county of Stockholm is centered in the city of Stockholm, consequently outside the county area.

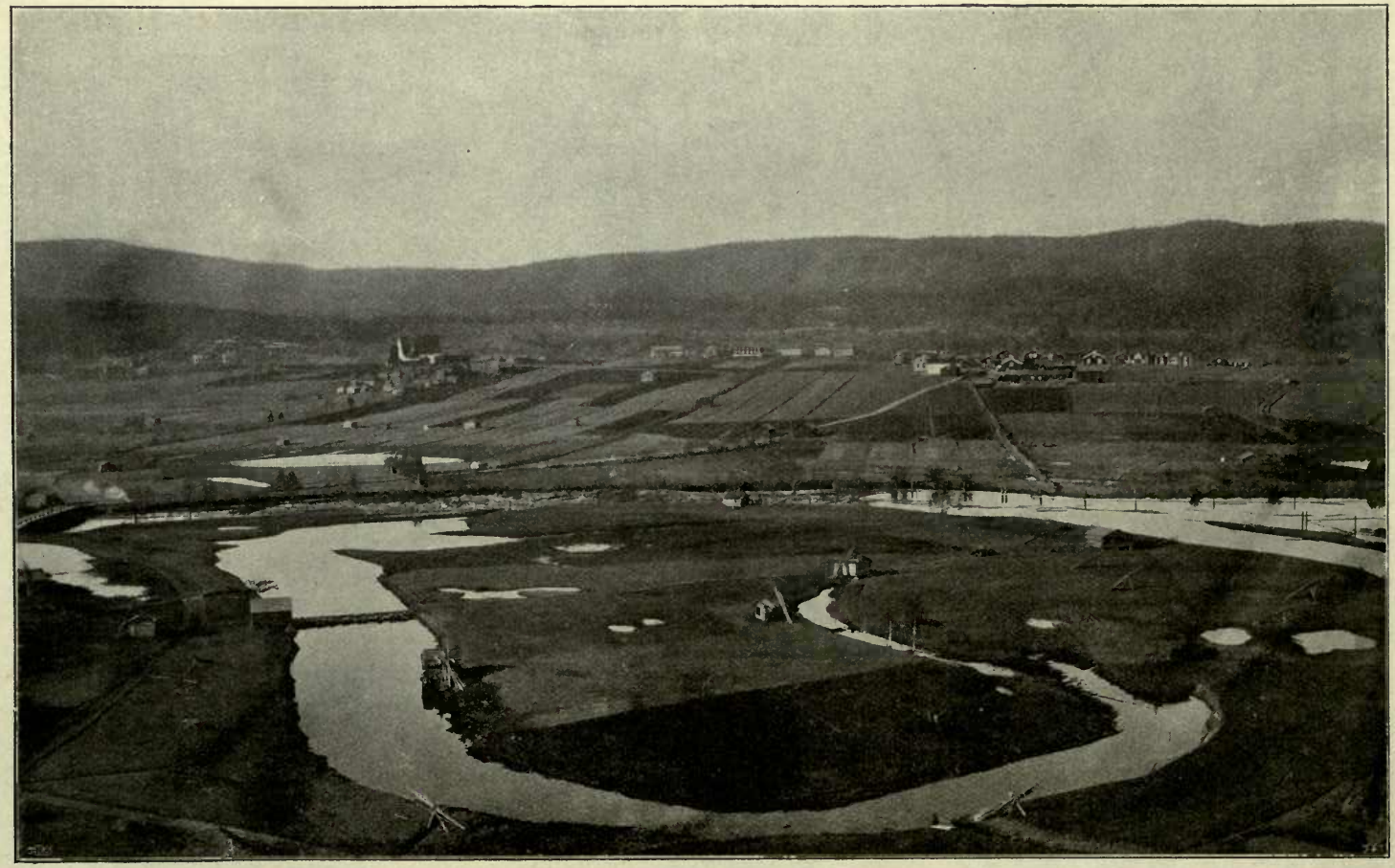
The most densely populated towns and the number of their inhabitants at the end of 1914 were as follows: Stockholm 382,082 (including the nearest suburbs 430,000), Gothenburg 178,030, Malmö 95,821, Norrköping 46,180, Gäfle 35,736, Hälsingborg 34,742, Örebro 33,112, Eskilstuna 29,130, Jönköping 27,745, Karlskrona 27,508, Uppsala 27,315, Linköping 24,399, Borås 22,696, Lund 22,485, Västerås 21,941.

From 1901 to 1910 the yearly average of marriages numbered, in round figures 32,000, the births were 136,000 and deaths 79,000; consequently the births exceeded the deaths by 57,000. The actual increase, however, owing to emigration is always less than the excess number of births, and amounted för the above mentioned period to a yearly average of 38,600.

Measures and Weights.

(Approximate Values)

1 meter (m.) = 3.33 feet	1 foot = 0.30 m.
1 kilometer (km.) = 1,000 m. = 0.66 mile	1 mile = 1.52 km.
1 kvadratmeter (kvm.) = 11.11 sq. feet	1 sq. foot = 0.09 kvm.
1 hektar (har) = 10,000 kvm. = 2.5 acre	1 acre = 0.40 har.
1 kubikmeter (kbm.) = 1,000 l. = 36 cubic feet	1 cubic foot = 0.028 kbm.
1 liter (l.) = $^1/_{100}$ hektoliter (hl.) = 0,22 gallon	1 gallon = 4.5 l.
1 kilogram (kg.) = 2.20 pounds	1 pound = 0.454 kg.
1 meter-ton = 1,000 kg. = 2,200 pounds	1 eng. ton = 2,240 pounds = 1,016 kg.
1 krona (kr.) = 100 öre = 0.27 dollar	1 dollar = 3.75 kr.



AGRICULTURAL DISTRICT
IN THE MIDDLE PART OF NORRLAND

AGRICULTURE.

The importance for Sweden of Agriculture and occupations connected therewith is characterized by the fact that it is regarded as the *principal occupation* of the people. The farmers are regarded as the backbone of the country. They have always had a word to say in affairs of State, and when the change in the representation-system was introduced, they became vested with greater influence than any other class, while in the country communities "Sweden's Peasants" have always been the governing body.

And still the part taken by agriculture in the industrial life of our country, like the farmers' influence in State affairs, is nowadays on the decrease. Industry, advancing as it is by leaps and bounds, leaves everything behind, as far as development is concerned. From having been an agricultural country with payment in kind Sweden has, during such a short period as half a century, begun to be a manufacturing country, with a comparatively rich supply of direct means of payment. This development, like all others, has its drawbacks too. Industry produces a proletariate thatregards social questions from the point of view of one who owns nothing, and makes us economically dependent upon export, while the decay of the country's agriculture brings us face to face with the ghost of famine, hindering our supply from abroad.

The maintenance and development of agriculture has therefore, for several reasons, received the special attention of our communities and the State during recent years. Since 1890 it has been organized and fostered by a State department named "Lantbruksstyrelsen" (The Board of Agriculture) with all the officials and assistants connected therewith, and for a hundred years has been represented by experts in the various agricultural societies. Later on, in the year 1900, it was the first of our industries to be represented at the King's Council table, in the person of the Minister for Agriculture. Even agriculture needs, to a certain extent, the assistance of a helping hand.

The domineering position held by the farmers in the management of State affairs during the 1870 and 1880 decades, indeed right up to the close of the century, is now no longer quite the same. To-day it seems as though that position is being partially transferred to the industrial working classes. The same is the case with the farmers' trade in relation to other trades. Practically speaking, a hundred years ago *nine tenths* of our people were occupied with agriculture or some trade connected therewith. The figures sank only very very slowly when industry began to make itself felt and new lines of communication were opened. So soon, however, as the two latter factors began to make rapid progress and claimed the assistance of masses of people, and at the same time both commerce and shipping were flourishing, agriculture, the staple industry of the country, began to lose countless numbers of hands. It was just about at the close of last century that our agricultural population reached, sank to 50 per cent. In the year 1900 only 48 per

cent of the population of the country was engaged in the cultivation of the soil, nor is the decline merely represented by so much per cent, for during the last generation it has become reduced from 3 millions to slightly more than $2^{1}/_{2}$ millions.

If one takes into account the importance of the value of production in the industrial life of our people, then the relative decline in our agriculture becomes all the more conspicuous. In the year 1910 the harvest was valued at 800 million kronor, while the industrial production was double, or 1.6 milliard. This represents, however, the gross value, which does not directly illustrate the actual production.

Even though agriculture has declined in importance, it would be quite a mistake to conclude that it is condemned to stagnation. The figures given above show that the *people* have become less attracted by agriculture, but by no means that *agricultural conditions* have become inferior. On the contrary, we find that it has made wonderful progress and justifies the brightest hopes for the future.

The ever increasing value of human labour has to some extent, necessarily been replaced by cheaper mechanical power. This is the reason why agriculture, in spite of the decline in the farming population, produces considerably more than before, thanks to improved methods, more intensive culture and the cultivation of new ground by the blade of the plough. The progress that our agriculture has made is simply enormous, while, on the other hand, the agricultural population has decreased and its influence become reduced. Moreover, it is quite clear that in proportion to the continual growth of industry, claiming more and more manual labour, the need of articles of food, which can already be supplied by the country, will urge on the work of compelling the soil to yield as much as possible, or in other words, to offer the farmer greater possibilities. The successful advance of our industry has also had a refreshing effect upon agriculture.

A hundred years ago agriculture and cattle-rearing were still on about the same level in Sweden as in the time of Gustavus Vasa, or similar to prevailing conditions in Germany, for instance, about 1800. It is true that the community-of-goods system in the villages had given place to the distribution of the soil among the villagers, but this system resulted in the division of pasture-land and meadow-land into a number of small plots spread over wide and extensive districts. *The General "Shift" of Land* introduced by the State in the eighteenth century paved the way for the time when each landowner would be able to cultivate his land energetically and independently. The reform, however, progressed but slowly, and ceased altogether when it was decided that each farmer should have the right to have his plots of ground united into at the most four "shifts." *The One Shift System* at the commencement of the nineteenth resulted in the consequences implied by the name. It proved, however, too radical; consequently *the compulsory so-called law-shift* of 1827 was introduced during the thirties and forties throughout nearly the whole of Svea and Gotha land, which was the foundation for the modern development of agriculture. The consequence of this was a period of progress and advance, which during the following decades helped agriculture to take the lead in the country's development until the economical crash, which occurred during the sixties, laid everything low.

The period just referred to had really been the flourishing age of agriculture with the help of the new implements of iron which began to be made in Sweden (from about the forties) and which facilitated the deeper preparation of the soil. The union of the small plots, however, paved the way for another system for the cultivation of the soil, making fuller use of its growing qualities. In the place of the old two shift system—one for fallow-land and one for fruit—or the three shift with fallow-land, autumn seed and spring seed intermittently

— there gradually appeared a richer variation of growth, in which artificial greensward played an important part. This variation of growth, which in the form called alternative cultivation is used throughout the greater part of our agricultural districts, signifies an important step forward. Instead of the soil being left uncultivated and unused every other, or each third year, or at the best each fourth year, it was then compelled to yield of its best six years out of seven. The autumn seeds are sown on the well prepared and carefully manured soil, rye or wheat, according to the quality of the ground, the harvest of which is reaped the following year. The clover and timothy-grass sown with the autumn seed does not appear before the scythe has done its work, and in the third year of the cycle a splendid field of clover is obtained. Twice mowed the clover-field, like timothy-grass, lives till the fourth and fifth year. Furrowed by the plough during the autumn, the field is sown in the spring with oats, which is again repeated in the seventh year, the last year of the growth. Corn, mixed grain, peas or potatoes can succeed the oats either one year or the two years. The character of the soil or the weather can also render it necessary to plough the field after 2 years when the growth is to be 6 years, or if necessary after 1 year.

Partially based just upon this alternative cultivation or itself the cause of it, *cattle-rearing* —which was beginning to be managed according to more modern methods as early as during the thirties—began to be a factor of increasing importance to our agriculture. No longer dependent upon natural fields for their supply of straw-fodder for their animals, the farmer could keep far more live-stock than before, with five sevenths of his arable-land producing fodder. The milk thereby obtained, the meat as the result of slaughter, or the animal felled and prepared for the market supplied him with ready cash all the year round, while the one-sided seed production had only replenished his pocket at harvest time. The change from payment in kind to payment in metal took place in connection herewith, favoured by the progress of industry.

The increase of the cattle stock resulted in a greater supply of natural manure. At the same time artificial manure began to be known for its economy, agricultural implements were gradually being perfected—in a word, agriculture began to be carried on in a more energetic and effective manner. This is especially true of the southern part of the country, thanks, above all, to the sugar industry. This industry, which had previously consisted of the refinement of raw-sugar from the tropics, obtained raw-material through the cultivation of white-beet in suitable parts of the country. White-beet, however, needs very careful preparation and well manured soil, if the cultivation is to lead to good results. In this way the creation of a new growth was furthered, a rotation of crops in which fallow-land had practically no place at all. The soil received sufficient manure so that it did not need "to rest" (absorb the nitrogen of the air) and was so well prepared that weeding with the aid of the plough was unnecessary. The first year, instead of naked fallow-land, produces a harvest of pasture fodder, then the autumn seed comes, and later, beet or some other kind of root-crop, then malting-barley, after which follows a single year's pasture-land, and then oats again—throughout the whole programme a suitable system of manuring is used each, and every other year. This is the system commonly used in sugar factory districts, such as the provinces of Skåne, Sydhalland, and Blekinge together with small parts of East Småland, Öster and Västergötland. This growth system has, to some extent, found its way northwards, partly, on large farms conducted on modern lines, partly, on good small farms where the limited extent of arable land makes it all the more important to make the most of every square foot. As the energy invested in the cultivation of the soil increases, the *growth system* has to give way to more modern rotations of crops, while in the most neglected districts of the

north, although nowadays only on a very small scale, two and three shifts still exist. It is the most extensive type of agriculture that can be used where there is plenty of space.

Agriculture and cattle-rearing in Sweden are undoubtedly very dependent upon the changes that are naturally to be found in the nature of the soil and climate in a country stretching so far North and South as Sweden. The richest country districts having the most highly developed agriculture are Skåne, Sydhalland, and Blekinge, then come Östergötland and Västergötland (the northern part), together with the provinces surrounding Lake Mälar, and also the island of Gottland. The cultivation of wheat is principally carried on in these parts of the country, although wheat grows in other counties too (south of the river Dal, and even so far North as Hälsingland). About half the wheat grown in Sweden (abt. 1,700,000 deci tons) is produced in the province of Skåne. There is, however, no doubt that Sweden possesses other wide expanses of soil suitable for the cultivation of wheat if only energetically and well prepared. The fertility of Swedish wheat-soil, in spite of its northern position, is so great that, judging from the quantity of the harvest per hectare, it is only surpassed by Denmark, Belgium, The Netherlands, and England. It is equal in quality to German soil, produces far more than France, Hungary, Roumania, etc.,— even double so much as The United States of America, and Italy, besides many other European countries, and about 50% more than Canada. The world-renowned plant refining establishment at Svalöf (Skåne) assists the comparatively rich production by cultivating new and very fertile species (Extra Square head, etc.), the demand for which grows from year to year. In 1911 the Swedish harvest of wheat produced was $21^1/_2$ deci tons per hectare, or just double the quantity of a hundred years ago, and very considerably in excess of the results obtained during the latter half of the last century. The cultivation of wheat has thus developed very rapidly. Whereas the growth of rye covers only double the ground surface of a hundred years ago and has remained at the same stage during the last generation, the ground surface covered by our wheat-fields has become sevenfold during a century, and almost doubled during a generation.

Rye, however, still holds its own as regards the making of bread, occupying 400,000 hectares against wheat with its 100,000 hectares. On the other hand it does not yield so much, the production nowadays being about 15 deci tons per hectare and altogether hardly three times double the harvest (about 6 million deci tons). That rye is nevertheless cultivated predominantly depends upon the fact that certain districts and certain kinds of soil in the southern part of the country (including parts of the province of Småland and Western Sweden) are not so suitable (in some cases are not *believed* to be suitable) for the cultivation of wheat. In the north rye will be found to far exceed the wheat, up to a line drawn from the Lake Storsjön in the province of Jämtland to the most southernly part of the valley of the river Torne.

The provinces of Dalarna and Gästrikland cultivate rye in a very remarkable degree (in spite of their being so far north and thanks to a liberal use of natural manure), and in the Eastern parts of the country in general, where the usual dry season in the early summer renders the cultivation of spring seed more doubtful. Then again the heavy ground there is very suitable for the autumn sown overwintering seed.

Oats, on the other hand, are chiefly to be found in the west of Sweden from Dalarna down to Halland; lighter soil and greater moisture in the spring in these districts make it suitable seed for sowing, and there they will be found to occupy by far the greater part of the arable ground. The province of Västergötland alone produces nearly $^1/_5$ of the wheat harvest. Generally speaking, oats may be said to be the grain most commonly

grown in Sweden. It now occupies double as much ground surface as rye alone, and if mixed crops are included (oats or corn and vetch peas or other peas) it yields more than double the harvest. Calculating per hectare the production of oats, however, is a little less than that of rye, nor is it so valuable. On the other hand, oats are irreplaceable as fodder, besides which, it supplies valuable straw, and is not so exacting as regards the manuring and ploughing of the soil. The Svalöf institute has produced quite a number of very fertile species of oats (Plume Oats, Seger Oats, etc.) which begin to entirely supersede the old black and scanty flag-oats. The well cultivated Swedish soil produces more rye and oats per hectare than The United States and the majority of other countries.

Corn, which occupies the fourth position among the various kinds of grain cultivated in Sweden, was in olden days the most important, supplying as it did the principal part of the country's entire harvest. Nowadays it is the least important of all. As late as during the nineteenth century it was on a level with rye and more important than oats, but whereas nowadays it covers a sevenfold greater surface and yields nine times double the harvest than it did then, the cultivation of corn has remained almost stationary, and, indeed, during recent years has experienced a period of decay. Corn is chiefly found in two different parts of the country, in the south of the province of Skåne, on the islands of Öland and Gottland, and the plains of Uppsala; malt is cultivated on these plains for use in the breweries,—partly, throughout the whole of Norrland (Northland) where corn is the only kind of grain that can be relied upon, with the exception of rye in certain districts. A kind of corn is cultivated in Norrland that grows exceedingly fast; it is sown late and the harvest is taken in early, sometimes after only 4 weeks' vegetation. Unlike other parts of the country, corn is used there even to-day for baking purposes just as in ancient times.

The total grain harvest in Sweden may be estimated at about 25 million deci tons, which shows that it has doubled since 1850 and become fourfold since 1800. On an average it makes about 14 deci tons per hectare of cultivated ground (at the present time Sweden has nearly 40,000 sq. kilom.), and about 450 per head per year. In 1800 the figure corresponding with the last mentioned was 250 kg. The production of grain has increased much more rapidly than the population, which has doubled only during a century. In spite of this, however, it is less equal to the demand now than before. At the present time the Swede consumes precisely double the quantity of wheat and rye (200 kg. per year) compared with a hundred years ago. Prosperity has increased to such an extent that the production of grain, in spite of its splendid development, has not been able to keep apace. There is consequently a very considerable import of grain into this country. Only during the middle of the last century did the export exceed the import, and very considerably too. The import was greater both previous to that period, and afterwards especially.

It would, however, be quite wrong to conclude that the agricultural industry in Sweden is not sufficient to feed the population. In the first place our agriculture has, as yet, reached a really high stage of development in some few parts of the country only; there are great expanses of land lying absolutely waste and are only being cultivated bit by bit. Secondly, cattle-rearing (from about the seventies and eighties when the export of grain declined and finally ceased altogether) has, as before mentioned, increased in importance, and has become a more and more profitable branch of Swedish agriculture. The reasons for this have already been touched in this article. It may be added that the elevated condition of the people, the growing needs of the industrial population for animal food, which is not so easily transported as vegetable food, and finally England's ever increasing demand for butter have acted as the co-operating influences upon the development of cattle-rearing.

At the present time cattle-rearing occupies a very important position. The varying conditions under which agriculture is carried on in different parts of the country naturally influence cattle-rearing too. Even the historical development has also had its effect. The improvement of the race was first considered in the south of Sweden. As early as in the beginning of the nineteenth century low-lands were procured from abroad (black and white), from the western part of the north German plains. They are large and heavy, yield much milk but with a comparatively low percentage of fat. They were considered susceptable to disease and are not so hardy as the native races. There are three native races, of which the middle Swedish red-mottled is the chief and most valuable from an economical point of view. This breed yields much milk possessing a high percentage of fat, and has been the object of continual, careful and successful refinement. In the north of Sweden we find chiefly the ancient *mountain breed* without horns, and white or many-coloured. It is considerably smaller and lighter, does not yield so much, but the production is exceptionally fat. Another type of ancient Swedish cattle is the so-called red poll-cattle in the west of Sweden. This type is also without horns, their other characteristics are similar to the mountain, breed but they are all red in colour. Some years ago "Short Horns" were imported but nowadays this breed has become merged with the native middle Swedish race. Another English breed, "*Ayrshire*," is often to be found pure bred, and as regards points it comes next to the red mottled but is superior to the non-improved country race. By means of a thoroughly developed prize system, bull societies, milk control, and pedigree registers, much energetic and successful work has been done for the benefit of cattle-rearing.

Whereas the products of agriculture were exported some years ago, *butter* is nowadays the farmers' chief export article. Butter making began to be an important factor when the milk-cooling method was introduced in 1860. In the seventies a modest export was begun, and the appearance of separators (invented by De Laval, a Swede) in the nineties gave rise to a much increased export. The production of butter thus not only covers home requirements (in connection with this it should be observed that margarine and vegetable margarine are important factors in the home consumption) but is also sufficient for an export (chiefly to England) valued at no less than 40 to 50 million kronor.* This development has been greatly assisted by collecting and co-operative dairies also by the great Swedish separator industry. The old practice of butter-making at home has almost entirely disappeared. The home industry now consists of delivering milk to the dairies and the separating of the milk by means of hand-separators. The old method exists only in distant parts of the country.

Besides being made into butter the milk is also used for cheese, which, however, hardly fills home needs, far from being sufficient for export. It is made, partly, into all-fat cheese, chiefly in the provinces of Västergötland, Östergötland, and Norrland, partly, into half-fat cheese (at present on the decrease) and finally into whey-cheese, chiefly in Jämtland. Gruyere cheese is imported in rather large quantities, Dutch and English cheeses too, and small French dessert cheeses. Attempts at imitation have not been quite successful. The dairies make use of the buttermilk and whey as food for pigs; skimmed milk is sold for consumption or is made into milk-meal and casein, all of which may be regarded as products of secondary importance. The manufacture of milk-sugar exists on a small scale. A good deal of

* The export of butter used to go via Denmark, and Swedish butter was sold as Danish. In this way the Danes derived a profit as intermediary. Nowadays the greater part of Swedish butter goes direct to England and under the Swedish national mark "runmärket" (the runic mark), which means that the butter has undergone State control. The cream has to be pasteurized and the butter, which must be without fault of any kind, must not contain more than 16 % of water.

the non-skimmed milk goes, it is true, direct on to the market for consumption—about $^1/_2$ kg. (or litre) per day per head, or about 1 milliard kg. annually. About double as much remains to be made into butter and cheese in the 1,400 dairies and private farms where they manage the milk themselves. Sweden possesses nearly two million cows, including the young. On an average they yield from about 3,000 kg. (in the south of Sweden) to 2,000 (in Norrland) annually. There are about half a million calves and two hundred thousand oxen and bulls. Oxen are nowadays used as beasts of burden in almost only the provinces of Östergötland and Småland, since in other parts of the country they have begun to be replaced by horses. The country possesses about half a million sheep and the same number of pigs. While sheep-rearing has declined (with the exception of the island of Gottland) and by no means supplies the country's needs of wool, pig-breeding has progressed rapidly and steadily in connection with the abundant waste from the dairy industry, sugar manufacturing, and the abolishment of duty on maze. This has resulted in a very important export trade of several millions. Beef and live stock are also exported in rather large quantities, as also hides and eggs, although the export of these latter does not exceed the import. The beef is bought from America and the eggs from Russia.

Half a million grown up horses and 100,000 foals are kept. Up to 1870 the number was comparatively decreasing from one horse per each fifth inhabitant in olden times to one per each tenth; since then a slight increase has been experienced. Horse-breeding exists chiefly in the provinces of Skåne (warm blooded animals), Västergötland, and Uppland (cold blooded).

The warm blooded animals are for the most part half-bloods of English, Oriental or more generally East Prussian and Hannoverian origin. A great many of them are used for military purposes and the army supplies nearly all its needs from Skåne. The cold blooded cart-horses are, in the south of Sweden, generally a cross breed with the Belgian Ardennese race, and to some extent with the British Clyde Dale type. In the northern and western parts of Sweden the north Swedish and Dalbo race are predominant. They are small, strong horses of ancient Swedish origin that have recently been refined with a blend of the Norwegian race. Ponies of very ancient race are produced on the islands of Gottland and Öland. The lively interest that has been shown in trotting has assisted the improvement of light draught-horses, just as horse racing encourages the improvement of riding-horses. The refinement of the various types is furthered by means of prize competitions, breeding-studs and stallion societies.

The foregoing brief account is sufficient to give us an idea of the nature of the Swedish farmer's work, and the conditions and results of agriculture and cattle-rearing. We have yet, however, to consider the conditions under which they work and their future possibilities.

Sweden, as is well known, is an old "*farmers' country.*" The greater part of the ground has never been divided up into large estates as in England and Italy. In the olden days when the nobility possessed the power and were favoured with munificent Royal gifts made to courtiers and warriors a number of large estates in certain districts, and especially in the dale of Lake Mälar were established and still exist. They are cultivated by crofters and farm-servants instead of by independent farmers. Nor has the invasion of industry of recent years failed to influence our agriculture. In consequence thereof the ground is very unequally divided. About one fourth of Sweden's agriculture is carried on by small farms owning at the most a couple of hectares. Two thirds—consequently by far the greater part—is in the hands of the real farmers who own farms varying in size from 2 to 20 hectares. A tenth part

consists of rather large farms of about 100 hectares, and 1 per cent is occupied by really large farms. Farms worked chiefly by the owner and members of his family provide 70 % of the total number. Then again, if one takes into account the division of the cultivated ground between the different classes of farmers, it will be seen that *small farmers and small farms* with at the most 10 hectares of ground own a fourth part. Half is divided into medium sized farms of up to 50 hectares and the remainder belongs to landowners, owners of very large estates and companies. It will thus be seen that the majority of Swedish farmers are real peasants or so-called small farmers, but that a comparatively large part of the soil is cultivated by large farms.

Efforts have recently been made to alter this condition of things. The advantages that large farms have in introducing new, modern and time-saving methods are recognized, but at the same time experience has shown that they are hardly economical. And what is still more important is the fact that the necessity of strengthening and supporting the position of the independent farmer so as to counterbalance the increasing mass of industrial workmen who are devoid of the sentiment of love of the soil, which is the foundation for a people's national feeling and love of country, is realised to the full. This is the reason why such energetic work is being done to provide as many small farms and "Own Homes" as possible. With this object in view the State has established a loan fund for "Own Homes," and both the State organizations and private unions are working to assist country workmen to obtain their own farms by means of the support of these cheap loans. Up to the present this has chiefly been done by cutting up the large estates and, partly, by *colonizing* virgin ground.

Such farms do exist, especially upon the domains of the State, but also on ground in the possession of private persons, on extensive tracts, and especially in Norrland. The work of colonizing, however, has not yet commenced in earnest, which to a great extent depends upon circumstantial and bureaucratic formalities in connection with the granting of the land. The examples set by The United States and Canada, however, gradually begin to teach the Swedish people how to overcome these difficulties, and the time cannot be far distant when ground will be more easily obtained than at present. Work in this direction has so far progressed that the majority of countries have established agencies that supply information and keep a register of farms of all sizes and prices that are for sale.

The price of Swedish soil varies very considerably according to its quality and proximity to the traffic-routes. Three hundred kronor may be said to be the average price per tunnland* (600 kronor per har) of arable land. Should the land be of the finest quality and very favourably situated the price can rise to as much as one or two thousand kronor, while distant land of inferior quality may be had for 150 to 200 kronor. The price of the land is, of course, influenced by the possibilities for transporting the milk to the nearest place of sale, the chance of being able to cultivate seed and root-crops that yield well, all of which explains why the soil in the province of Skåne generally demands the highest price—and is also the most profitable.

The Swedish farmer is very conservative in his habits, so that "something new" is always very cautiously received. The fact that everyone can read and has a desire for further knowledge, and the special opportunities offered the public for education, as also the care bestowed by the State upon agriculture through the aid of teachers, advisers, prize competitions, and tours for the purpose of study, etc., etc., do much to further progress year by year.

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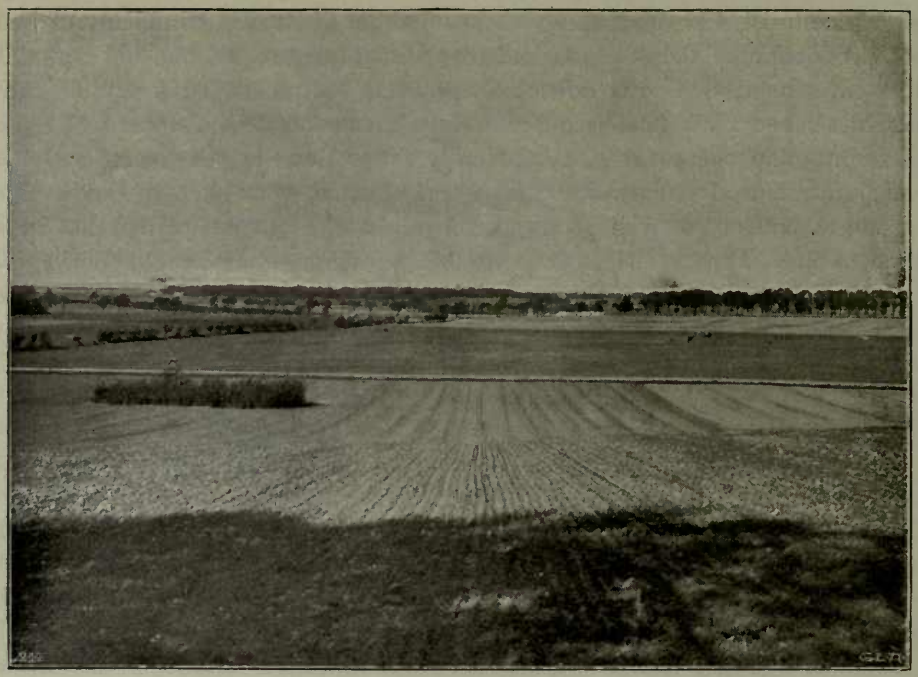
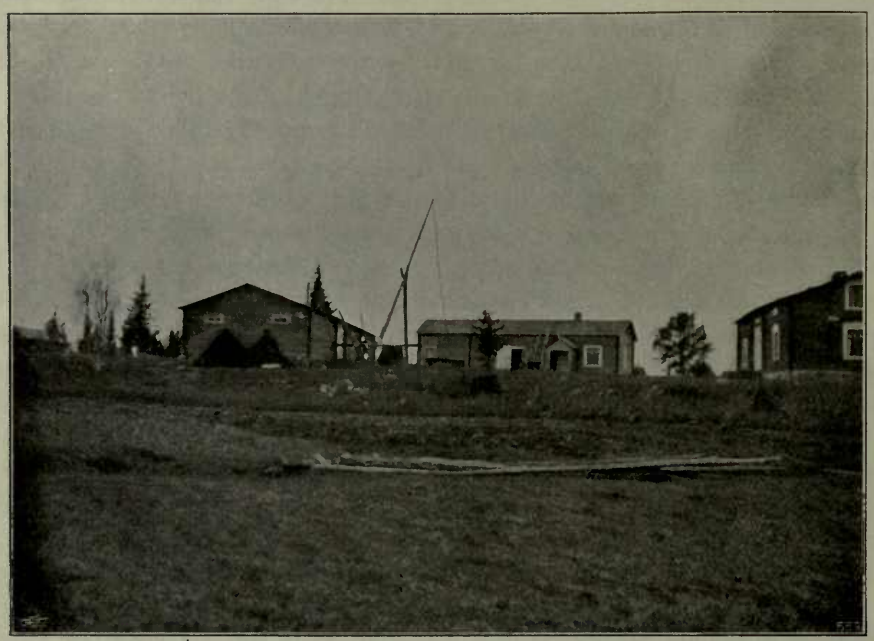
* Nearest equivalent = acre.

The Swedish agriculturist, like his colleagues in all other countries, complains of bad times and the poor production of the soil. Calculating with the mere interest on capital it is perfectly true that investments in farms do not always turn out the most profitable concerns On the other hand, one must take into account the cheap conditions under which the farmer lives, small rents and cheap firing, considerably lower than in the towns, and the greater part of food-stuffs at production value. Industrial people, who have to buy everything out of their wages and commercial profit, thereby miss the advantage that lies in a rich supply of "hard cash." The farmer meets troubles enough when he experiences ill luck, bad crops and misfortunes connected with his cattle. On the whole, however, he lives a less risky existence, a quieter and more healthy life than others. If he only pursues his calling with diligence and never-tiring energy the Swedish soil will reward him for his pains.

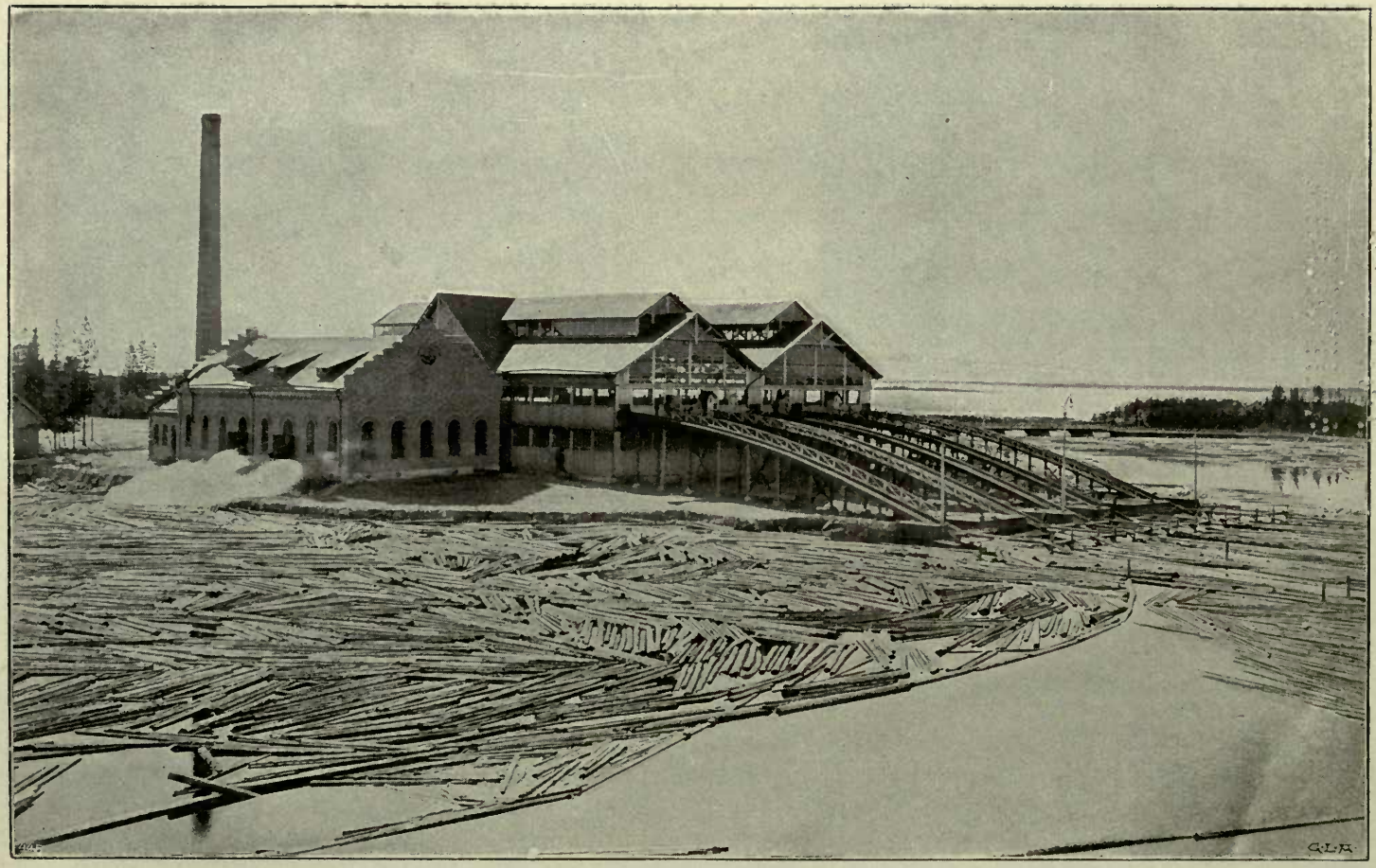


AGRICULTURAL DISTRICT
IN SKÅNE
(SOUTH)



FARM
IN THE TORNEÅ RIVER VALLEY
(FAR NORTH)

MIXED PINE TREE FOREST,
SÖDERMANLAND



MO SAW-MILLS,
NORDMALING

FORESTS AND TIMBER INDUSTRY.

Sweden is a land of forests. More than half her area, or a little more than 21 million hectares (52 million acres) is covered with forests. Sweden may also be described as one of the European countries possessing the greatest wealth of forest-land, and Finland only can in this connection compete with her for the foremost position in Europe. On an average there are 4 hectares forest-land to each head of population. The importance of these forests, however, varies in different parts of the country. In the provinces of Västernorrland and Gävleborg about 83 % of the total area is occupied by forests. In the south of Sweden, on the other hand, forests are comparatively of but little importance. In the province of Malmöhus only about 9.5 % is wooded land.

It is not, however, merely the country's tremendous forest area, and compared with the population, her great wealth of timber that makes Sweden such a rich forest country. Owing to the excellent quality of the ground itself (principally moraine and gravel) and a climate suitable for the pine-tree, the timber produced is of the finest quality. Moreover the timber is very easily realised. During the winter the snow-covered forest-land and frozen lakes offer excellent facilities for the transport of the logs through the wildest districts. The countless rivers and streams. of such assistance in floating the logs on account of their rapid current, supply a time-saving and inexpensive means of transport to the coasts where the saw-mills and wood-pulp factories are generally situated. Norrland (Northland) is especially well off as regards watercourses, for no district in that part of the country lacks rivers to such an extent as to prevent the timber supply of the forests being realised. It may, therefore, be truly said that Sweden is exceptionally favoured as far as forestry is concerned, and that as regards cheap transport ways for the timber, Swedens is unrivalled. The majority of the floating courses have been constructed in the rivers of Norrland, Värmland and Dalecarlia and in length reach a total of 25,000 kilometre and the cost of their construction is said to have been nearly 150 million kronor. For the sake of comparison it may be mentioned that the total length of the Swedish railways in 1912 was 14,164 kilometer. These waterway annually carry 85 million logs, representing a calculated mass of 425 million cub. feet, or nearly 12 million cub. metre. The approximate cost for floating a cub. foot an average distance of 300 kilometre is 1.8 öre, while the railway charges in Sweden per cub. foot for the same distance is 12,5 öre or 7,8 times more than the natural way.

The consequence of this, however, is that the forests have already been very heavily taxed and large trunks are gradually becoming more scarce.

Up to the present the timber industry, especially in the North of Sweden, has largely been based upon the realization of the capital existing in the timber of the virgin forest. Under such conditions it will be easily understood that the question has been very much

discussed as to whether the forests can, in the long run, bear such severe treatment as hitherto, or whether the industry in the future will have to be reduced on account of lack of raw-material. With the intention of getting at the actual state of things and of obtaining a trustworthy survey of the condition of forestry a trial valuation of about 1,932,000 hectares of forest-land has been undertaken in the province of Värmland. By adopting a simple and cheap method of valuation (so-called intermittent line valuation mathematicaly controlled by the theory of probability) it has been possible to determine the capital value of the timber, its increase, the classification of the age of the trees and its different characteristics etc. for a considerable area. This first valuation has in the main shown that the danger of the capital value of the forests being reduced is in reality less than what the majority of the experts believe. A similar valuation of the forests of the entire country is at present being considered and it is calculated that such a valuation can be carried out for an amount not exceeding one million kronor. Thus Sweden will be the first country in the world where an actual stock-taking of the forests has been undertaken.

At present the out-turn of timber from Swedish forests amounts to more than 40 million cub. m. per year, or about 2 cub. m. per hectare of productive forest-land.

This out-turn of timber is used in the following manner:

Timber as raw material and	0.4	million	cub. m.
The manufacture of sawn wood-goods and goods otherwise prepared	8.5	"	"
The manufacture of wood pulp	5.7	"	"
Charcoal for use in mines	6.0	"	"
Timber for domestic purposes (building and fuel)	22.0	"	"

The gross value of the annual production of Swedish forests is calculated at:

Timber for domestic purposes	about 165	million	Kronor
Saw-Mill Industry	" 200	"	"
Manufactured wood-pulp	" 115	"	"
Mining and manufacturing industry, as far as forestry is concerned	" 40	"	"
Manufacture of Tar	" 2	"	"
Joinery and other wood-goods	" 35	"	"
Pasture-land	" 15	"	"
Forest Berries	" 1	"	"
Hunting purposes	" 0.5	"	"
Total	573.5	million	Kronor

It will therefore be seen that the forests both directly and indirectly contribute about 1 1/2 million Kr. per day to the subsistence of the Swedish people. In this connection it may be mentioned that in 1913 the value of the production amounted to 98,633,762 Kr., not, however, including all timber for domestic purposes nor what has been sold in small consignments, the value of which is not less than 150 million Kronor:

In the year 1908 Sweden's national wealth was calculated at 14 milliard Kr. In this calculation the forests were valued in the following way:

Forests belonging to the State	230	million	Kronor
Other public forests	79	"	"
Private forests	1,248	"	"
Total	1,557	million	Kronor

This calculation, at least as far as the forests are concerned, is rather too low than too high. An investigation regarding the value of State forests in the provinces of Norrland and Dalcarlia which was carried out in 1913 on behalf of the Committee for Defence (these forests have an area of nearly 3 million hectares of productive forest-land) has shown that the saleable stock of timber represents a sale-amount of 440 million Kronor with a supply of timber, not including small trees, of 132 million cub. m. (45 cub. m. per hectare) of which 107 million is regarded as saleable.

In the foregoing the valuation of all the forests in the province of Värmland at the cost of the State has been mentioned. The result has been that per hectare of forest-land there are 66.4 cub. m. of log wood without bark, or reckonning an increase of 17.8 % for the bark a cubic mass of 78.5 per hectare. If Värmland is representative of other parts of Sweden, which is not at all unlikely, the entire supply of timber would amount to about 1,678 million cub. m.

If these figures are compared with the afore-mentioned amount of out-turn it would, it is true, calculating with a period of 100 years, show that at present the out-turn exceeds the growth. It must, however, be observed that the out-turn chiefly comes from the old forests in Norrland which from an economical point of view can no longer yield interest and therefore ought to be renewed, and also that considerable amounts have been expended on drainage and forest cultivation. Under these conditions Sweden ought in the future to be able to produce much more timber than hitherto. Should it prove necessary during the next few decades to reduce the country's out-turn there is therefore reason to expect a greater supply later on.

The forestry and timber trades are very ancient industries in Sweden. Ever since the time when the people of this country first began to come into livelier commercial contact with other nations the productions of the forests have constituted a very significant part of the export. But in those days the products consisted of pitch, tar, masts and spars, and also to a certain extent of planks and boards, which, however, were at first not sawn but prepared with the axe.

After the Dutch succeeded the Hanse in the seventeenth century as the leaders of commerce in the North they became very considerable buyers of Swedish wood-goods. In the eighteenth century when England reached the foremost position in the world's commerce she too imported a quantity of wood-goods. In the middle of the nineteenth century, however, England's requirements were greatly increased. The high duties on wood-goods which had arisen during the Napoleonic wars began to sink and were altogether abolished in 1866. In this way the Swedish timber trade found a valuable market in England which has ever since been kept and from the same period we are able to date the really flourishing Swedish timber industry which now exists. At that time the majority of the works established in Norrland were saw mills driven by water-power built near water-falls in the vicinity of the coast. In some cases these water-mills were quite large concerns having as many as 15 saw-frames. One inconvenience they all had, however, almost without exception and that was that they were not situated close to the sea. The sawn goods had therefore either to be carted or tugged in barges down to the harbour for shipment, which was a very expensive proceeding, or else they had to be floated, which, on the other hand, spoiled the appearance and quality of the goods. The timber industry did not reach the rank of a great industry in the modern meaning of the word until the advent of the steam saw. The first steam saw in Sweden was built at Vivsta Wharf near Sundsvall in 1851, the second at Kramfors in the province of Ångermanland in 1852. Efforts

were afterwards made to establish the saw-mills near the coast to which the raw material was sent by means of floating. In this way the development of the saw-mill movement advanced, especially in the provinces of Värmland, Norrland, and Dalecarlia where the large rivers supplied the necessary means of transport. The saw-mills were then found at the estuaries of rivers having harbours in the archipelagoes where large ships were able to anchor in a protected position and load direct from the saw-mill's stock.

Some few figures will assist in illustrating the development of the Swedish timber industry. In the year 1821 Sweden possessed 3,633 saw-mills with a manufacture of 267,000 dozen planks and boards of which about 200,000 dozen were exported. In the year 1861 Sweden had 59 saw-mills and 4,933 saw-mills driven by wind and water, and the export of planks and boards only amounted to 1,478,000 dozen. Fifteen years later the export was three times as great and the export value of all unrefined and refined wood-goods increased to more than 100 million Kr. a year. In 1912 the value of unrefined and hewn, sawn and other more or less refined wood-goods (consequently also including joinery etc.) exported from the kingdom amounted to about 190 million Kr.

If one also takes into account the wood-pulp and paper industry which has recently come into existence and is advancing by leaps and bounds and which nowadays occupies an exceptionally prominent position in Sweden's industrial life, then the Swedish forests by their production alone would show an annual export value of about 325 million Kr. (in the year 1912), corresponding to no less than 43 % of Sweden's total export. In addition to this there is also the value of other forest products. The Swedish iron industry, for instance, uses charcoal for a value of about 30 million Kr. annually of which about 20 million Kr. is calculated for export purposes.

In the exhibition there is a table showing the total export of Sweden and also the export of wood-goods, wood-pulp and paper made from wood-pulp. The following data are taken from the above mentioned table.

Year	Sweden's total export Kronor	Export of:			Total
		Wood and Timber*	Wood pulp	Manufactured goods of Wood pulp	
1863	92 524 000	12 023 958	—	—	12 023 958
1870	152 502 000	54 102 736	—	—	54 102 736
1880	236 643 000	89 260 357	2 229 930	6 605 475	98 095 762
1890	304 592 000	107 616 200	8 049 444	22 347 394	138 013 038
1900	391 334 000	153 030 255	26 727 787	13 862 803	193 620 845
1912	760 617 000	164 748 412	93 954 732	39 374 313	298 077 457

* Manufactured goods of wood not included.

The total value of Sweden's export of wood-goods, wood-pulp and paper articles made from wood-pulp has, only for the period 1863—1912 amounted to about 6,690 million Kronor. If the year 1913 is included, for which only approximate figures are at hand, then the export value would amount to over 7 milliard Kronor. For the period 1863 to 1912 the total value of all Swedish exports amounted to just a little over 15 milliard Kronor.

At the present time the distribution of Sweden's timber export among the various importing countries ought to be of special interest. Of the 6,800,000 cub. m. wood-goods, exported from Sweden in the year 1913 no less than 2,600,000 cub. m. or 38 % found its

way to Great Britain and Ireland. In the same year France bought from Sweden about 950,000 cub. m., Denmark about 740,000 cub. m., Germany about 725,000, Norway about 375,000, The Netherlands about 360,000, Belgium about 190,000 and Spain about 170,000 cub. m. The same year Sweden exported to countries outside Europe about 645,000 cub. m. wood-goods of which the greater part, or about 480,000 cub. m. went to Africa and about 100,000 cub. m. to Australia.

The importance of the forests is not only to be found in the unusual export of their products and that the home requirements of timber can be satisfactorily supplied. The forests belonging to the State, especially, in the North of Sweden, are very extensive indeed and form a considerable direct addition to the revenue of the country. In the year 1912 for instance the State forests gave an income of 13.7 million Kr. The administration costs amounted to about 4.3 million Kr. and therefore there remained a net profit of 9.3 million Kr. For the year 1915 the corresponding amounts are calculated at 19.5 and 11 million Kr. respectively. In the year 1912 the out-turn of the State forests themselves reached 3.3 million cub. m., corresponding to 0.9 cub. m. per hectare of possible forest land.

* * *

The forests of Sweden, contrary to those of America, contain only a few different kinds of trees. In this country as elsewhere it is the supply of warmth, that is to say the length of the period of vegetation and the temperature during the summer, that determines the development of the different species. In such an extensive country as Sweden from north to south several species of trees reach the limit of their extension and therefore the country is generally divided into many different "forest regions." In the most southernly part of the country — the beech forest district — the forests chiefly consist of foliferous trees beech and some oak. This part of Sweden is also the most cultivated. North of this district lies the so called "berry forest region," which really only consists of two kinds of trees, namely, pine and fir. Here and there in the southern part of this district are clusters of oak or beech and in the northern part the beech occasionally appears on the banks of the streams and rivers.

Near the mountains the forests of pine and fir get thinner and thinner, the birch becomes more and more evident and the pine forest region is finally succeeded by a birch region which forms a green fringe against the rugged rocks of the mountains. The old primeval forests, rich in timber, begin, however, gradually to disappear. The devastation of forests as carried on in America no longer takes place in Sweden. Thanks to the existence of laws regulating the forests timber-cutting is carried on in a very rational manner, bearing in mind that a new growth will easily be obtained.

Large trunks, however, are becoming rarer as time goes on. Only in Lapland and in the upper part of Dalecarlia does there exist a large extent of spared timber in private forests protected by the compulsory system of marking the trees, and also in the great expanses of forest-land belonging to the State.

Timber-cutting for sale, may not be undertaken before the State foresters have marked each tree ripe for sale and only a certain number are marked so as not to endanger the future of the forests.

In the coast districts of upper Norrland (in the province of Vesterbotten) the young forests, by means of what is termed "the law of dimension", by which trees that do not mesure at least 21 cm. in section at a distance of 4.75 m. from the thick end may not be hewn for the market. In the centre of Norrland (in the province of Jämtland and certain

parts of Dalecarlia) a special law for the protection of forests has been introduced for the preservation of forests near the mountains and where timber may not be cut for the market without first having been marked by a State forester. In other parts of the country a special so called "re-growth law" has been in force since 1905 which stipulates that timber-cutting shall not be carried on, or after cutting has taken place the ground shall not be treated in such a way as to endanger a new gowth.

The islands of Gottland and Öland in the Baltic have even severe laws concerning their forestry still in force.

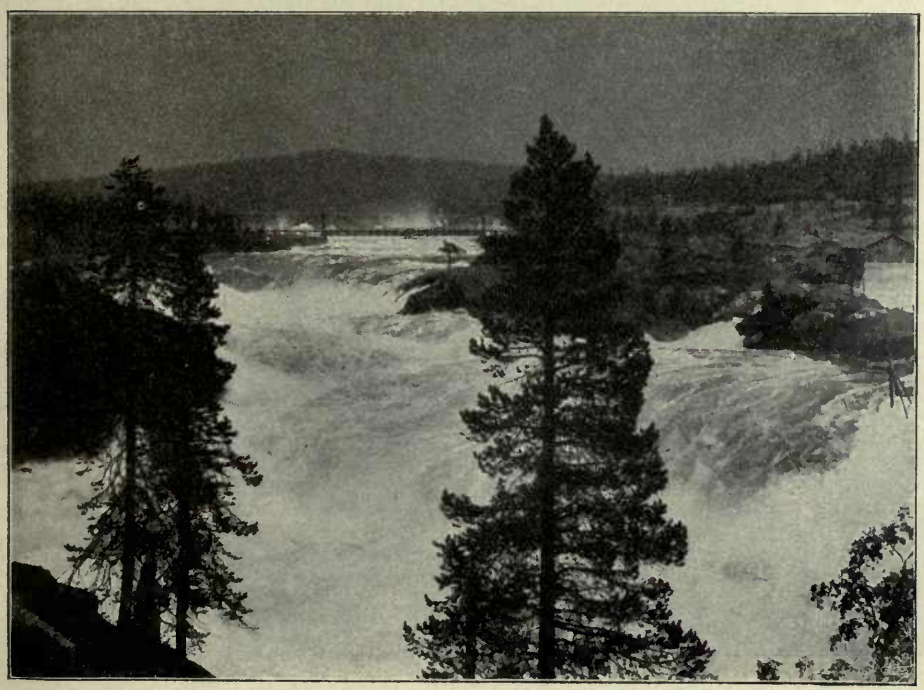
In order to control obedience to these last mentioned forest laws each province has what is termed a forest protection board which employs trained foresters. The 22 boards in existence are partly in receipt of a State grant of 167,500 kr. and about 116,000 kr. from various corporations in the provinces besides a special forest protection fee of 1.3 % of the value of the timber as it stands in the forest which is hewn for sale. In the year 1913 this latter fee amounted to 1,282,239 kr. This money was used by the forest protection boards for the cultivation of private forests and also for the spreading of instruction concerning their proper treatment. Such information is also spread by a large association called The Swedish Forestry Association formed in 1902 and which has led the way in all matters concerning the increase of the public interest in and knowledge of the country's forests, their protection and value. The well attended meetings and excursions held by this society which provide more exchange of opinion than any other similar society prove the truth of the foregoing statement, as also the Society's journal "The Swedish Forestry Association's Journal" and "The Forest", both of which have large circulations. Norrland's Forestry Union which works in the interest of Norrland alone also publishes two periodicals. The purely scientific investigations into the conditions of forestry have chiefly been supported by the State Forest Experiment Station founded in the year 1902 which has already published 10 volumes containing the result of their investigations.

It must also be added that higher education in forestry has been much improved. The Institute of Forestry has developped into a real High School which from 1915 will carry on its work in a new and stately building that is also to be the home of valuable collections.

It will thus be seen that excellent work has been done, especially during the last few decades on behalf of forestry. Swedish forests offer in this respect a very suitable field of labour. It is true that the trees of this northern climate need comparatively long life before they are ripe and ready for the forester's axe. But on the other hand Swedish forest ground with its virgin qualities is in advance of that of many other countries. After the cutting has been performed the forest usually fertilizes itself rather easily, or the cultivation can be carried out at a comparatively small cost.

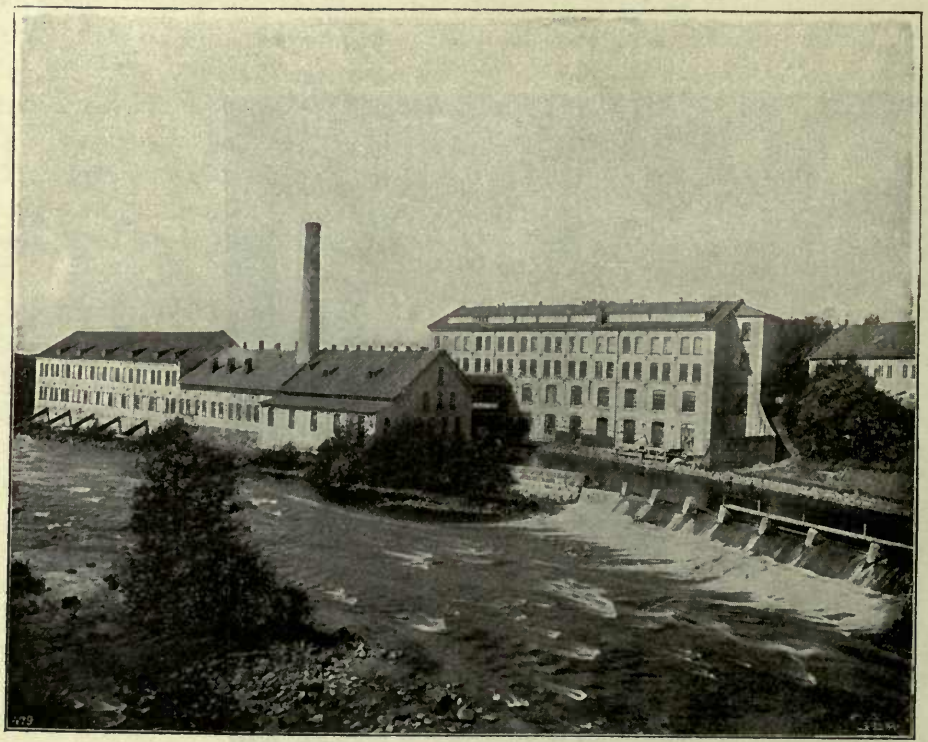
The forests are therefore perhaps the greatest source of wealth Sweden possesses which if good care is bestowed upon them and they continue to enjoy wise administration will in the future, in a still higher degree, add to the profit and welfare of coming generations.

STORA SJÖFALLET
(THE GREAT FALLS)



THE PORJUS FALLS

TROLLHÄTTAN POWER STATION



SLOTTSMÖLLAN SPINNING MILLS
AT HALMSTAD

WATER POWER.

The great wealth in waterfalls that has fallen to the lot of this country has for hundreds of years excercised an exceedingly beneficial influence on the development of her industry, and above all when in connection with the refinement of her principal raw materials, such as iron-ores and timber.

The Supply of Water Power.

The total supply of water-power in Sweden has, on one or two occasions during recent years, been the object of calculations* which it was possible to base upon very satisfactory data. These have shown that the water-power of the entire country, which is available on an average for nine months of the year, represents about $4^1/_2$ million turbine H. P. of which about $^3/_4$ lies north of the river Dal. During low water the theoretical supply of power of the rivers in their present condition is reduced to about half of the above mentioned estimate. Up to the present it has, however, been seen that the installations of power on an average exceed the nine-months-effect by 40%, and the total installation should consequently, when used to its full extent, represent about 6.2 million H. P.

As far as the supply of water-power is concerned Sweden is among the most fortunate countries in Europe, being about on the same level as Norway, France, Italy, and Austria. Thanks to the wealth of *lakes* which Sweden enjoys the discharge from the different watersheds is already comparatively even and the high-water catastrophes so troublesome to alpine-countries are practically out of the question. Moreover, these natural lakes offer favourable opportunities for an effective and inexpensive *regulation* of the flow of the streams, which has already been done in many places and which is also being prepared in a number of large rivers. As regards the water courses, that are most important from a point of view of power, the great lakes control no less than 75% of the total collecting areas of which the lake area comprises about 10%.

Besides this there is another point, the most important of all, and that is that the great lakes, as a rule, are situated on the elevated inland plateau so that their regulation excercises beneficial influence on comparatively large and important parts of the fall stretches. The banks of the lakes and water courses are generally steep and their regulation therefore seldom causes serious damage; for instance one valuation shows that if all the large lakes in the country were regulated, less than a thousandth part of the flat land would be destroyed. By means

* Den skandinaviska vattenkraften och dess framtidsmöjligheter, Sven Lübeck 1906. (Scandinavian Water Power and its Future Possibilities by S. Lübeck, 1906). Sveriges vattenkraft och dess förmögenhetsvärde, Mauritz Serrander 1913. (Sweden's Water Power and its Capital Value by M. Serrander, 1913.)

of such a regulation the water power available during the whole year under normal conditions can, when required, be made to reach about the same amount as the afore-mentioned 9 months' effect.

How Water Power is Used.

As early as in the fifteenth century water-power began to be used in Sweden for industrial purposes. It was called to the aid of the *manufacture of iron* for which the country is celebrated, and which is nowadays chiefly concentrated to the central part of the country. The next great period of development was not commenced before the 1870 decade when the *wood-pulp industry* was introduced, which nowadays is very extended throughout the southern provinces and the midlands, principally in the western districts and is steadily increasing in Norrland as far as up to Luleå. The development of these two branches of industry and the more important establishments in connection therewith have been described in detail elsewhere. The textile and milling industries also use a considerable amount of water-power.

Finally the progress that has been made during the last two decades in the transmission of power and the electro-chemical and electro-metallurgical industries has provided an important step. The distribution systems which are principally in the hands of private companies, and also to a certain extent in the hands of the State and municipalities, now form a rather closely woven web, especially over the most southernly, south-westerly and central parts of the country, transmitting power from the waterfalls to industrial undertakings and for the requirements of municipalities. The largest undertakings for the distribution of power are, commencing from the south, the following: Hemsjö Kraft A. B. (The Hemsjö Power Co. Ltd.), Sydsvenska Kraft A. B. (The South Swedish Power Co. Ltd.), Yngeredsfors Kraft A. B. (The Yngeredsfors Power Co. Ltd.), Statens Trollhätteverk (The State Power Station at Trollhättan), Gullspångs Kraft A. B. (The Gullspång-MunkforsPower Co. Ltd.), and the electric power companies of Värmland, Svartälven and Örebro in the midlands, and The State Power Station at Älvkarleby, The Forsse Power Station, etc. The total length of the more important power conducts (Primary) in Sweden is about 5,000 km. Electric blast furnaces on A. B. Elektro-Metall's (The Electro Metal Co. Ltd.) system are in use at Domnarvet, Stora Kopparbergs Bergslags A. B. (The Great Kopparberg Bergslag Co. Ltd.), at Hagfors, Uddeholms A. B. (The Uddeholm Co. Ltd.), and at Trollhättan, A. B. Trollhättans elektriska smältugn (The Trollhättan Electric Blast Furnaces Co. Ltd.) and the introduction of similar blast furnaces is being planned in connection with several other iron works. Other electrochemical and similar kinds of works have been established for carbide and carbide-nitrogen (works at Alby and Ljunga) ferro-silicon, manganese iron and other ferro-alloys (works at Gullspång, Vargön, Trollhättan, etc.), zink (works at Trollhättan), chlorates (at Månsbo and Alby), etc. Finally, during the present year the work of electrifying the railway between Kiruna and Riksgränsen (in the far north of Sweden) has been commenced. The electric power for this line, which is principally used for the transport of iron-ore, is taken from the new power station at Porjus, owned by the State.

The largest water power stations of Sweden are the following:

Name of Works.	Owners.	Power of installations in turbine H. P. [Addition under construction ( )].
Trollhättan	The State	80 000 (20 000)
Älvkarleby	"	52 000
Untra	City of Stockholm	38 000
Porjus	The State	37 500
Bullerforsen	The Great Kopparberg Bergslag Co. Ltd.	30 000
4 power stations on the river Lagan (Knäred)	The South Swedish Power Co. Ltd.	27 800
Kvarnsveden	The Great Kopparberg Bergslag Co. Ltd.	20 000
Mockfjärd	The Western Dal River Power Co. Ltd.	20 000
Gullspång	The Gullspång-Munkfors Power Co. Ltd.	18 000
Ljunga Works	The Stockholm Super Phosphate Manufacturing Co. Ltd.	18 000
Alby and Ringdalsfors	The Alby Water Fall Co. Ltd.	15 900
Forshult	The Uddeholm Co. Ltd.	15 800 (5000)
Finnforsen	The Town of Skellefteå	10 700
Yngeredsfors	The Yngeredsfors Power Co. Ltd.	8 500
Forsse	The Graninge Works Ltd.	7 900
	etc., etc.	

The total amount of water-power used in the year 1915 represents therefore an installation of about 850,000 T. H. P., that is to say, about 14 % of the water-power resources of the country.

It is worthy of mention that during recent years the Swedish Mechanical Industry has, with few exceptions, manufactured and delivered all the machinery and mechanical outfit for Sweden's water-power stations. For instance turbines from the Kristinehamn Works, Finshyttan Works, Nydqvist & Holm in Trollhättan, Borås Works, etc., electrical machinery from Allmänna Svenska Electric Co. at Västerås, Nya Förenade Electric Co. at Ludvika, Luth & Rosén Electric Co. of Stockholm, etc.

The water-power works that will be completed in 1915 or at present under construction, are given in the following table according to their size.

Size.	Number.	Total Turbine H. P.
50 000 H. P. and over	2	132 000
25 000—50 000 H. P.	3	108 000
10 000—25 000 H. P.	6	109 000
5 000—10 000 H. P.	18	116 000
1 000— 5 000 H. P.	128	253 000
200— 1 000 H. P.	296	132 000
	453	850 000

The various uses for which water-power is adopted will be seen from the following approximate classification, valid for the year 1915:

Industries.	Turbine H. P.	Percentage.
The Iron Industry	235 000	28
The Timber Industry	260 000	30
The Textile Industry	40 000	5
The Electro-Chemical Industry	90 000	11
Distribution* of Power and various other purposes	225 000	26
Total	850 000	100

* The distribution of power (including that of the State) will in 1915 comprise altogether 415,000 H. P. but the large industrial subscribers have been included in the table under their respective groups.

It should be observed that of the great supply of water-power in the north of Sweden, up to the present only a very small amount has been utilized, which chiefly depends upon unfavourable transport conditions and the closing of the harbours on account of the ice in the Gulf of Bothnia from four to six months of the year, but also owing to legal questions still awaiting solution.

Legislature, Authorities and Organization in connection with Water Power.

The Swedish water laws generally recognize riparian owners as the lawful possessors of the water and water-power washing his banks, and there is no doubt that this proprietary right to the water-power has greatly encouraged them to take advantage of the power. This private right of possession, however, is not allowed to prevent the progress of communication in certain large water courses, where navigation, timber floating, fishery and large drainage enterprises represent interests which have for ages been guarded by an ancient privilege called "Kungsådra."

The water laws at present in force were chiefly passed in the year 1880 and are consequently not in accordance with modern requirements, as far as the principles of water construction rights are concerned. These laws were completed in 1899 with a number of rather impractical decisions regarding the rights for constructing dams across rivers under "Kungsådra." Finally in 1902 a law was passed containing technical decisions for the drawing of electric power conducts (with concessions for 40 years) in connection with the right of expropriation for such purposes.

A considerable amount of legislative work is at present being done in connection with water-power development. Thus as early as in 1910 a very comprehensive new bill relating to water law was brought forward, which was chiefly intended to provide practical rules for the rational regulation of the lakes and of the profiles of the water courses, among other things, by means of suitable co-operation between the owners of the falls, and also by simplifying the treatment of legal questions in connection therewith. New proposals have recently been worked out, partly referring to the laws of timber-floating, and partly in order to secure the delivery of electric power to subscribers, in connection with which a thorough investigation was made concerning the various methods suggested for the control of power distribution in Sweden. The committee for the consideration of these laws has, however, not found it necessary at present to introduce special economical legislation for such enterprises. For several years requests have been made from other quarters for decisions for economical concessions based upon foreign legislative principles in connection with the construction and utilization of waterfalls and electric power conducts. It seems, however, that public opinion realizes more and more the conditions for the future development of the Swedish water-power industry, peculiar to this country, which gives one reason to hope for a practical solution of the legislative project, although a definite solution can hardly be expected before 1917.

The Swedish State owns about 16% of all the water-power in the country, chiefly in Norrland but also in the south of Sweden, namely, the whole stretch of falls in the river Göta between lake Vänern and the sea, and a number of other large waterfalls which have been purchased for the future supply of electric power for the State Railways. Besides the contentions that were made in 1903 by the so-called "Committee for Waterfalls," the State has, during recent years, by means of law-suits, brought forward a large number of claims to the water right in the large rivers of Norrland independent of the shore rights,

claims which have, however, up to the present been refused by the courts, with only a few exceptions. In the meantime many waterfall owners have unfortunately been prevented from benefiting from the falls. It is true that in 1910 and 1911 it was decided that the State should be allowed to let out waterfalls on lease or with the so-called "Waterfall right," which renders it possible to mortgage the hired estate. The leases are for a period of 60—75 years both with and without redemption money upon the eventual cessation of the tenancy to the State. The same regulations were also intended to be suitable for the conditional hiring of disputed falls, but after many years have not yet been used, and evidently are not at all suitable as a basis for new water-power undertakings in Norrland. A very considerably revised proposal may therefore be expected during the year 1915.

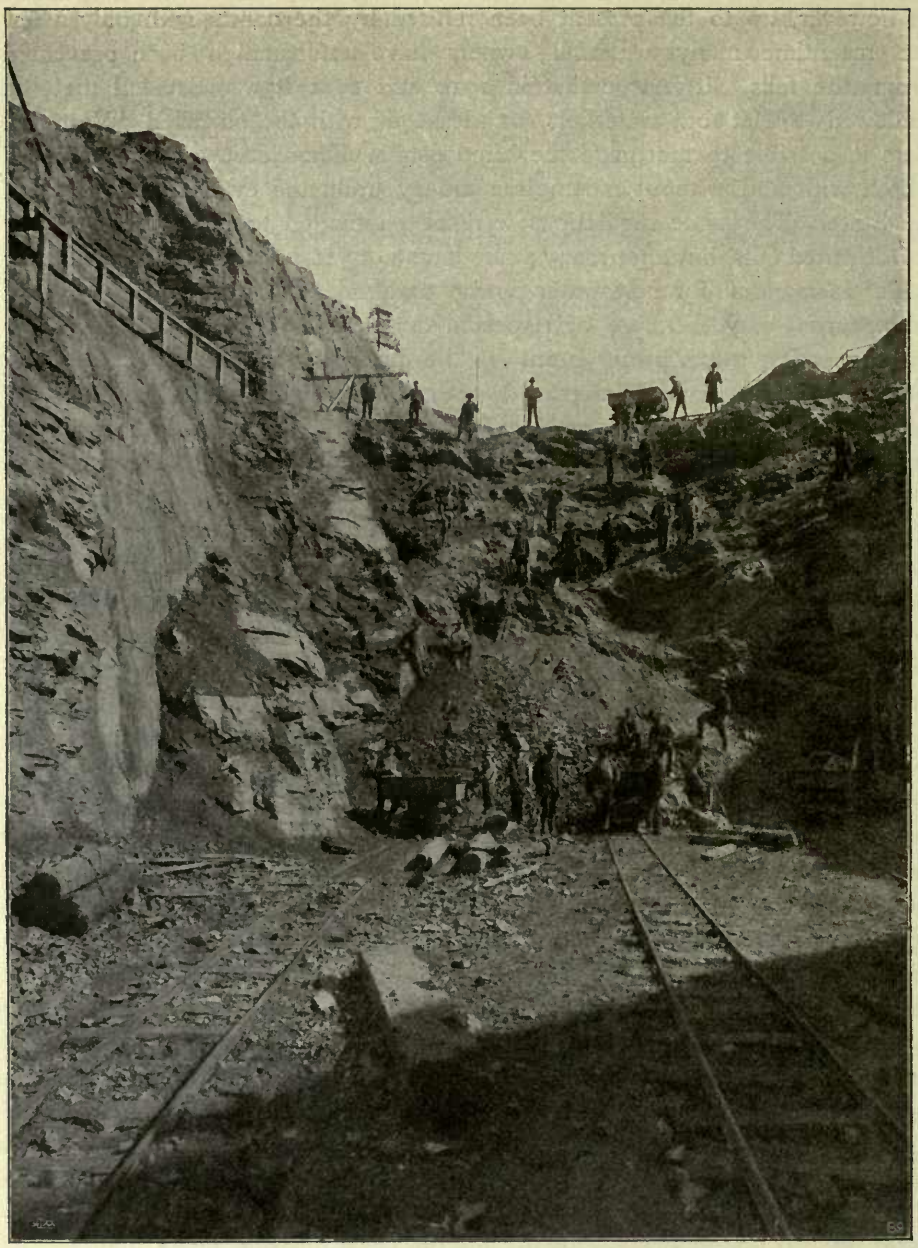
All questions concerning water-power used to be chiefly in the hands of *Väg- och Vattenbyggnadsstyrelsen* (Highway and Waterway Board) which together with a number of other authorities still has to give its opinion in all questions relating to the damming of rivers. The law of 1902 concerning the use of electric power also provided for the Electrical Inspection Department in the Board of Trade (four inspectors for the kingdom). *The Hydrographic Bureau,* under the management of Dr. Axel Wallén, has since 1908 worked with about the same programme as similar institutions abroad, upon the systematic gauging of the interior water courses of the country. In 1909 *Vattenfallsstyrelsen* (The Waterfall Board), under the management of Colonel F. V. Hansen, was established, chiefly with the object of administrating the waterfalls and interior waterways belonging to the State. This department has carried out, or is carrying out, the afore-mentioned power stations at Trollhättan, Porjus and Älvkarleby, as also the extension of the Trollhätte canal between Lake Vänern and the sea.

Finally some private organizations should be mentioned, of which the following are a few:

Svenska vattenkraftföreningen (The Swedish Water Power Association) is a union of corporations, municipal and private water-power works, and private persons. It was founded in 1909 chiefly with the object of advancing the application of Sweden's water-power by means of spreading technical, economical and legal information.

Svenska Elektricitetsverksföreningen (The Union of Swedish Electric Works) is a union of the majority of the largest electric works in the country.

Vattenbyggnadsbyrån (The Hydraulic Construction Bureau) is a private firm of consulting engineers, founded in 1902 by the late Professor J. G. Richert and has projected and managed the construction of a great many water-power plants and river regulations in Sweden and abroad, for the State, municipalities and private persons.



MINING AT GELLIVARA

MINING AND THE MANUFACTURE OF IRON AND STEEL.

From time immemorial mining and the manufacture of iron have been industries of very great importance. The principal reason for this is that Sweden possesses one of the greatest supplies of iron-ore in Europe. According to a valuation of the supplies of iron-ore of the world at present known, which was published at the International Geological Congress of 1910, Germany's supply was reckoned at 3,607 million tons of iron-ore, France 3,300 million tons, and England 1,300 million tons, while the Swedish deposits of iron-ore are calculated at 1,150 million tons. It must also be observed that Swedish iron-ore is unusually rich. According to the above-mentioned extensive international investigation it is calculated that the whole world possesses 1,300 million tons of iron-ore which has 60% or more of iron; of this quantity Sweden owns no less than 1,035 million tons.

The Swedish iron-ore supplies are found in two separate districts, one in the midlands, north and west of Lake Mälar, and another in the far north of Sweden, a little beyond the Polar circle. The following are the most important mining fields in the midlands: Dannemora, Grängesberg, Norberg, Riddarhyttan, Striberg, Dalkarlsberg, and Persberg. In the north of Sweden we find Kirunavara, Gellivara and Tuollavara which are being worked, and Luossavara, Svappavara, Leveäniemi, Ekströmsberg, and Mertainen which belong to the State and are not yet worked. The Swedish ore-deposits vary considerably in size. In the midlands the breadth of the ore is generally from five to twenty meters, but in some places, such as Grängesberg and Stråssa, it is as much as about a hundred meters. The length of the ore-lenses varies from some few meters up to hundreds of meters; as a rule a number of lenses lie close after each other so that the ore-field becomes very great in extent. The Norberg minefield, for instance, has a length of nearly 20,000 m., Grängesberg 4,000 m., and Riddarhyttan 3,500 m. and so on. The northern ore-fields have much greater dimensions. The Kirunavara-Luossavara ore-fields have together a length of 7,500 m. with a breadth of ore of 20—196 m., and the large fields of Gellivara have a length of 5,000 m. and a breadth of up to 100 meters.

The following table shows that Swedish mining has experienced a rapid increase:

Tons per Year		Tons per Year		Tons per Year	
1833—40	235 000	1871—75	795 263	1896—00	2 294 760
1841—50	270 000	1876—80	726 712	1901—05	3 564 046
1851—60	349 000	1881—85	877 408	1906—10	4 626 913
1861—65	464 363	1886—90	932 470	1911	6 150 718
1866—70	553 759	1891—95	1 519 325	1912	6 699 226

In the year 1911 the whole world produced 136 tons of iron-ore. Thus Sweden supplied about 4.5% of this quantity and occupied the seventh position among the iron-ore producing countries of the world. Since 1871 Sweden and the United States almost increased their production of ore ten times, while Great Britain for instance has remained stationary in this respect. The chief part of the iron-ore mined in Sweden is exported unrefined, which, as will be seen in the following table, chiefly depends upon the fact that Sweden lacks a natural supply of coal. The extent of Sweden's export and its distribution will be seen from the following table:

Year	Sweden's total production of Iron ore	Sweden's Export of Iron ore to						Total Export
		Germany	Great Britain	Belgium	France	America	Other Countries[1]	
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
1906	4 501 656	2 941 245	204 161	18 341	26 400	30	471 039	3 661 216
1907	4 478 917	2 838 561	446 635	112 153	26 252	11 119	86 997	3 521 717
1908	4 712 494	2 948 386	450 014	79 768	39 521	11 140	125 439	3 654 268
1909	3 885 046	2 546 321	407 855	89 062	24 898	121 139	7 178	3 196 453
1910	5 549 987	3 276 605	584 185	141 579	32 251	270 661	98 319	4 413 600
1911	6 150 718	3 706 636	575 984	159 290	41 422	262 591	340 975	5 086 898
1912	6 699 226	4 127 764	298 950	63 547	— [3]	— [3]	1 030 392[2]	5 520 653

[1] In these figures, however, are included the export of ore to Norway, to which country the ore is only sent as goods in transit, and chiefly are intended for Germany.
[2] Of these 979 316 tons to Norway chiefly as transit goods.
[3] Nowadays as transit goods to Norway.

As regards the quality of Swedish iron-ore it has been shown that no other country possessesa similar supply of ore with such a high percentage of iron; besides which the greater part of the ore mined in the midlands is unusually free from phosphor and sulphur, and consequently is an excellent material for the production of steel of the highest quality. Statistics show that the average quality of ore from the midlands contains 0.005—0.020% phosphor and 0.005—0.050% sulphur. During recent years the Swddish iron manufacture has obtained a further addition of ore free from phosphor and sulphur since the magnetic concentration of low grade ores has become more general, and as a consequence the production of briquettes. The development of the manufacture of concentrates and briquettes is shown by the following figures:

Year	Concentrates, Tons	Briquettes, Tons
1906	131 407	78 205
1907	178 567	88 532
1908	296 400	193 216
1909	225 983	148 380
1910	365 985	247 946
1911	381 190	255 948
1912	520 710	288 553

The total quantity of concentrates, which is manufactured according to the methods invented by Mr. Gröndal, a Swedish engineer, has a percentage of iron of 50—70 and the percentage of phosphor only exceptionally exceeds 0.010%, although the raw ore which is refined has in certain cases contained more than 1% of phosphor. With the object of making

the concentrates in pieceform and at the same time reduce its percentage of sulphur it is briquetted according to the Gröndal method by heating up to 1,200—1,400 degrees C. without the addition of any binding substance, whereby the concentrate is softened by the heat and becomes a coherent mass. The briquettes thus obtained seldom have a percentage of sulphur of more than 0.010%. In 1912 the Swedish iron-ore mines employed 10,500 workmen and value of the iron-ore produced was 49.6 million Kr.

The Manufacture of Iron and Steel.

The Swedish iron industry is of very ancient origin. As early as prehistoric times iron was manufactured in Sweden from hydrated ores, collected at the bottom of the lakes and marshes. The smelting was done by means of holes made in the ground and with the aid of wood as fuel. These holes were lined with slabs of stone. The inhabitants soon learned how to use the rich metals found in the ore, and small iron-works began to appear near the water-courses. Our ancient documents bear witness of a considerable mining industry. In a deed of exchange dated 1288 Stora Kopparberget is already mentioned and a deed of sale concerning certain interests in the Norberg mining fields bears the date 1303. In 1347 Stora Kopparbergs Bergslag obtained their first royal privileges. Several of our steel works still in existence were founded in the sixteenth and seventeenth centuries. An abundant supply of rich and pure ores, wealth of charcoal and more than sufficient water-power soon enabled Sweden to play an important part in the international iron market, and at the commencement of the eighteenth century Sweden was the country that produced the largest annual supply of pig-iron. At that time, however, several metallurgica inventions were made which very greatly neutralized the afore-mentioned advantages regarding the natural supplies upon which Sweden based her pre-eminence as an iron-manufacturing country. In the year 1730 cokes replaced charcoal as fuel for blast-furnaces in England, and very soon afterwards manufacturers learned how to eliminate phosphor from highly phosphoric pig-iron by means of puddling. Thus as soon as the discovery of the extraction of iron suitable for ordinary purposes from low quality ores with the aid of coal was made, the extent of the manufacture of iron in England, Germany and France soon exceeded that of Sweden.

The supply of very high quality ores and first class fuel in the form of charcoal has enabled Sweden to maintain her prominent position as the producer of the finest quality of steel in the world. As will be seen in the following, the Swedish manufacture of steel enjoys a steady increase, and at the same time it is very evident that efforts are being made to extend and perfect the manufacture of the steel before it is placed on the market. As regards the manufacture of Swedish pig-iron it is, as has already been mentioned, chiefly based upon ores containing a minimum of phosphor and charcoal as fuel. The supply of ore free from phosphor can nowadays, especially through the introduction of Gröndal's method, be said to be unlimited and the price of pig-iron is determined in the first place by the price of charcoal. Since, however, the waste wood obtained from the forests and saw-mills is becoming more and more used for the manufacture of cellulose, the supply of charcoal is being reduced and consequently its price has risen. The charcoal question is therefore of the greatest importance to the iron industry, and the most energetic efforts are being made to reduce the price of charcoal on the one side and to spare its consumption in the blast furnaces on the other. The coaling of the waste wood in furnaces instead of producing charcoal in heaps may be mentioned as an effort in the former direction. Charcoal heaps produce less coal than furnaces, besides which, furnaces enable one to collect the by-products of tar, methylated spirits, wood-vinegar, etc., etc.

On the other hand, as has already been mentioned, efforts are being made to reduce the consumption of charcoal at the iron works. Previous to the year 1900 all steel, even the simplest implements for home use, was produced from charcoal pig-iron whereas nowadays cokes are beginning to be used as fuel at iron-works that only manufacture steel for the Swedish market. Thus in the year 1912 86,000 tons of cokes pig-iron were manufactured.

The most important step taken for the reduction of the consumption of charcoal dates, however, from the year 1910 when the electric blast-furnace, invented by three Swedes, Messrs. Lindblad, Stålhane, and Grönwall, was technically worked out at the expense of "Järnkontoret," (The Institute for the advancement of the Swedish Iron Industry) so that it was then possible to introduce it into several Swedish iron-works. In this furnace only so much charcoal is consumed as is necessary for the reduction of the ore, that is to say 20—23 hl. per ton, while all the heat essential for smelting is supplied by electric power. About $^1/_3$ H. P. is used per ton of pig-iron with an electrode consumption of 3 kg.

The consumption of charcoal at Swedish iron-works has, owing to the afore-mentioned measures, been constant during the last few years, while the manufacture of pig-iron has rapidly increased, as will be seen from the following table:

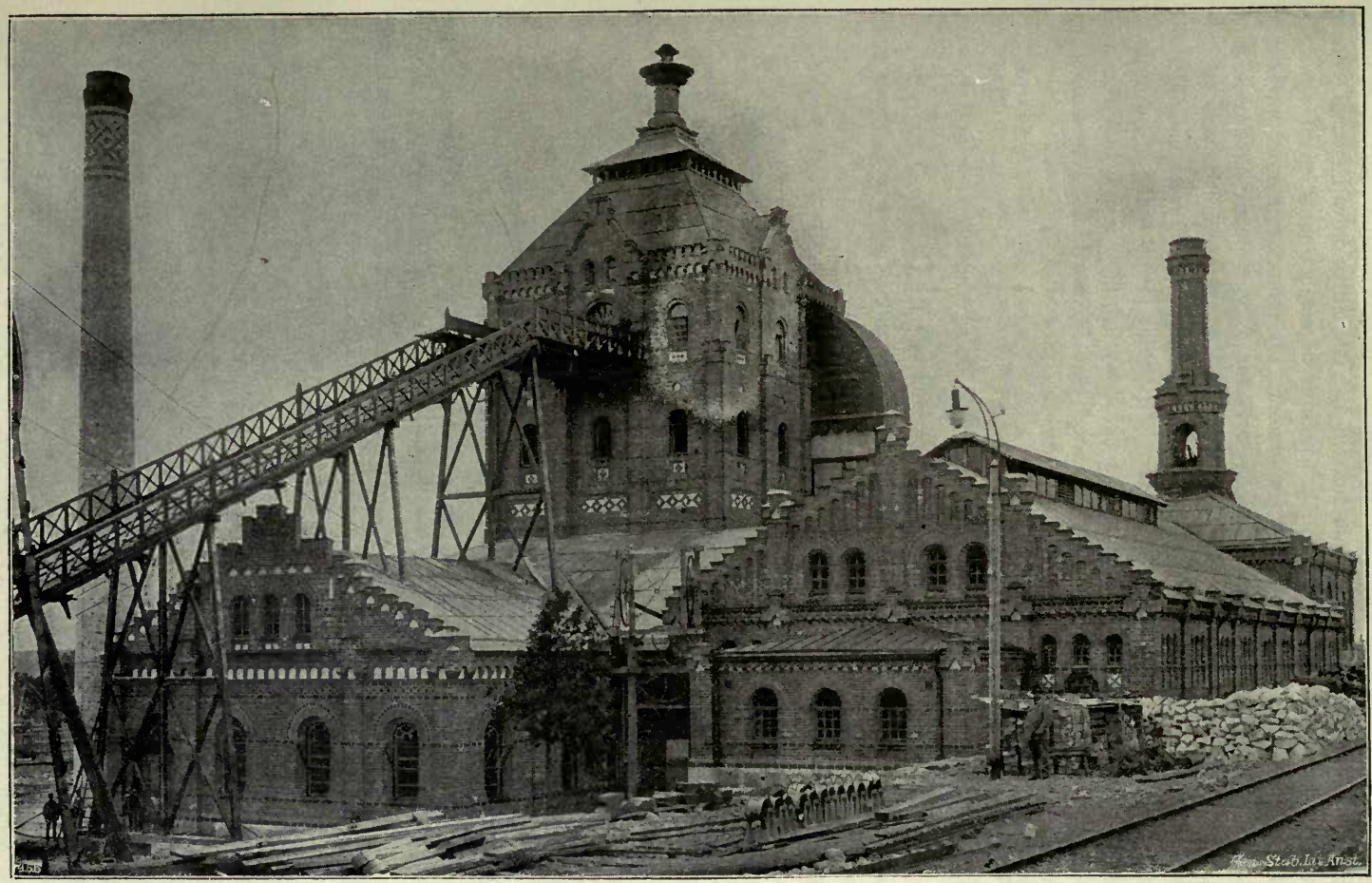
Year	Annual production of Pig-Iron	Consumption of Charcoal m^3 per year	Annual Export of Pig-Iron
1861—65	204 826	—	14 212
1866—70	267 854	—	24 280
1871—75	332 456	—	54 320
1876—80	357 224	—	35 973
1881—85	429 377	—	53 093
1886—90	446 578	—	59 205
1890—95	471 147	—	66 766
1896—1900	517 796	—	82 781
1900—1905	528 255	4 565 580	85 470
1906—1910	567 418	4 140 744	117 891
1911	634 392	4 054 130	150 444
1912	699 816	4 321 858	192 788

Of the quantity manufactured in 1912, as given above, 86,853 tons were cokes pig-iron and 17,561 tons were electrically produced.

The table shows that Sweden's export of charcoal pig-iron has rapidly risen. The export of pig-iron, which is of the highest quality guaranteed to contain a maximum percentage of 0.020 phosphor and 0.010 sulphur, is used as raw material for tool-steel and especially for war-material (armour-plate, guns, etc.). Of the export of 1912 103,348 tons were shipped to England, 41,818 tons to Germany and 20,698 tons toFrance. Smaller quantities were exported to The United States of America, Italy, and Japan. As charcoal pig-iron of such an excellent quality cannot be produced in any other country, Sweden enjoys a certain monopoly of this special branch of the iron-market.

The Production of Wrought Iron and Steel.

In Sweden, as in other countries, the production of wrought iron has for ages only been carried on in hearths with charcoal as fuel. The metal was prepared according to old German and Belgian principles after a system which is still to be found in Dannemora, where the



KARMANSBO IRON WORKS
AT KÖPING

world-renowned so-called Walloon iron, the purest wrought iron in the world, is manufactured. But at the commencement of the nineteenth century a new kind of blooming was introduced into Sweden from England, called the Lancashire hearth process, which compared with the Walloon process was characterized by a considerable reduction in the consumption of charcoal. These two processes are still used in Sweden for the production of large quantities of wrought-iron known for its toughness, malleableness, and, in general, for its unusual low percentage of phosphor and sulphur. This wrought-iron is chiefly sold for export, partly in the form of blooms, and partly in the form of rolled or forged bars. The highest qualities are used in England and Germany as raw-material for the production of finest tool-steels. Considerable quantities are sent to the Orient, where it is exceedingly popular for all kinds of forging. In The United States this iron is generally known as "Norway Iron." Regarding the high quality of the Swedish wrought-iron it may be mentioned that Harbord, the renowned English metallurgist, in his latest "Metallurgy of Steel" touching tool-steel says:

"The highest quality of cement bars is made from best Swedish iron — — — — — The Ⓛ-iron, made from purest Dannemora iron ore, is probably the brand which has the highest reputation for producing the finest qualities of steeel."

The manufacture and export of wrought-iron during recent years will be seen from the following table:

Year	Production in Tons	Export in Tons	
		Slabs, Blooms and Billlets	Forged and Rolled Bar Iron
1891—95	215 770	11 616	168 563
1896—00	192 147	21 453	166 626
1900—05	183 031	21 740	172 680
1906—10	155 468	26 380	143 780
1911	146 722	27 600	129 200
1912	148 828	35 500	117 200

The manufacture of steel was introduced into Sweden in the year 1858 when the first Bessemer works was laid down. Although the honour of having invented this method must be given to England, it is generally known that the details of the process were worked out in Sweden and that a Swede, G. F. Göransson, who soon afterwards founded the Sandviken Iron Works, has the honour of having first carried out the Bessemer process on a commercial scale.

This method was found to be exceptionally suitable for Sweden with her ores free from phosphor and sulphur, and her cheap water-power, and consequently it soon became widely spread until during the last few years it gradually had to give way to the Open Hearth process. The Open Hearth method was introduced into Sweden in the year 1868 and after much experimenting it may be said that at the commencement of the 1880 decade it was rendered suitable for Swedish conditions. It was not before 1894 that the manufacture of Open Hearth steel exceeded the production of Bessemer steel.

The basic Bessemer method (Thomas Gilchrist's process) was not used on a large scale in Sweden before 1891, and just about at the same time the basic Open Hearth process was introduced.

The following figures illustrate the manufacture of Bessemer and Open Hearth steel in Sweden:

Year	Bessemer Steel, Tons			Open Hearth Steel, Tons		
	Acid	Basic	Total	Acid	Basic	Total
1861—1865	2 292	—	2 292	—	—	—
1866—1870	3 666	—	3 666	—	—	—
1870—1875	14 665	—	14 665	—	—	—
1876—1880	21 975	—	21 975	3 498	—	3 498
1881—1885	47 976	—	47 976	14 077	—	14 077
1886—1890	73 102	—	73 102	—	—	47 489
1891—1895	79 822	8 267	88 089	—	—	83 981
1896—1900	74 235	27 168	101 403	113 703	57 418	171 121
1901—1905	47 295	33 156	80 451	119 385	113 463	232 848
1906—1910	38 730	42 001	80 731	137 417	187 847	325 264
1911	41 116	52 737	93 853	148 322	224 383	372 705
1912	43 317	63 937	107 254	160 418	243 700	404 118

As shown by the above table, about 4 times as much Open Hearth steel as Bessemer steel is nowadays manufactured in Sweden. The quick decline in the manufacture of Bessemer steel, which was so noticeable during the years 1895—1905, has now come to a standstill, which shows that there is, however, a fast market for Bessemer steel, and as a matter of fact many foreign buyers are of the opinion that Swedish Bessemer steel is, for certain purposes and especially for edged tools, far superior to Open Hearth steel of a similar analysis, and that in general it is the very best steel on the world's market. Basic Bessemer steel is chiefly used in Sweden in the form of girders, plate, building materials, etc.

The acid Open Hearth steel, however, in a more or less prepared form, such as drill-steel, chisel-, file-, and spring-steel and also wire of various degrees of hardness, comprises the principal part of our steel export. To this is added our basic Open Hearth steel. Manufactured from our pure ores the basic Open Hearth steel is the most genuine and the softest iron material on the world's market and competes with our Lancashire iron that has been celebrated for ages. The absence of impurity in the Swedish steel together with its body still makes it very popular and although its price, on account of increased working costs, and more expensive charcoal, etc., is considerably higher than the products of other countries, it enjoys a steady market and increased demands.

During the last few years energetic work has been done here in Sweden for the development of the electric steel smelting processes. In connection with this work Kjellin, a Swedish engineer, has been a pioneer. In 1900 he built his first induction furnace which was succeeded later on by Röchling-Rodenhausen's furnace. Other types of electric steel furnaces, of which some are of Swedish construction, are now in use at several Swedish steel works, and the wonderful supply of cheap water-power the country possesses gives every reason to hope for rapid development in this branch of the Swedish steel industry.

The Manufacture of Ferro Alloys.

A rapidly increasing manufacture of ferro-alloys in electric furnaces has been carried on in Sweden since 1904. This manufacture principally aimed at the production of ferro-silicon but the making of ferro-silicon-manganese was soon commenced.

Ferro-chrome, ferro-wolframium and other alloys are nowadays also made. The manufacture of the most important alloys is illustrated by the following figures:

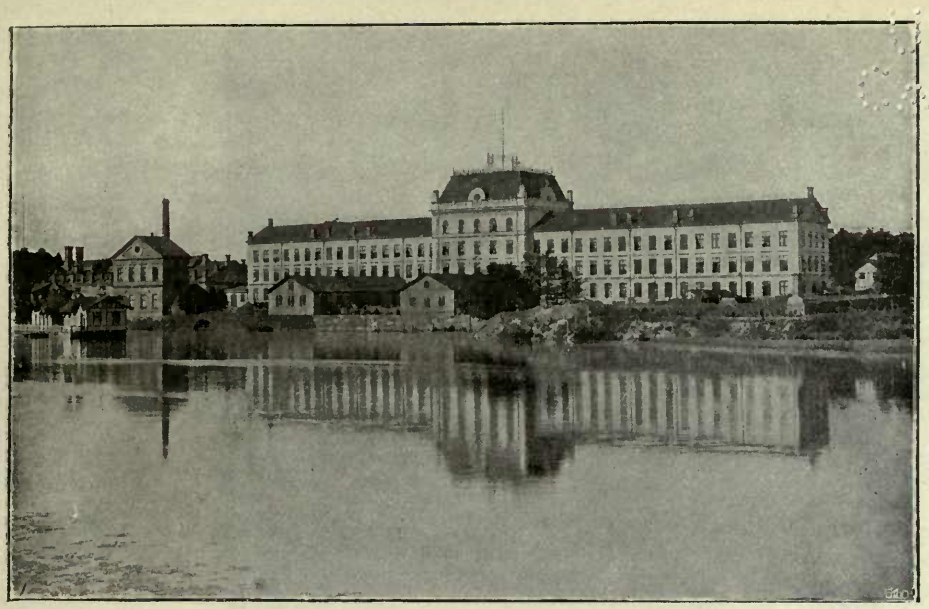
Year	Ferro-Silicon Tons	Ferro-Silicon-Manganese Tons
1907	950	—
1908	1 077	25
1909	2 524	—
1910	4 570	186
1911	4 104	472
1912	5 984	1 028

The greater part of this production is sold for export.

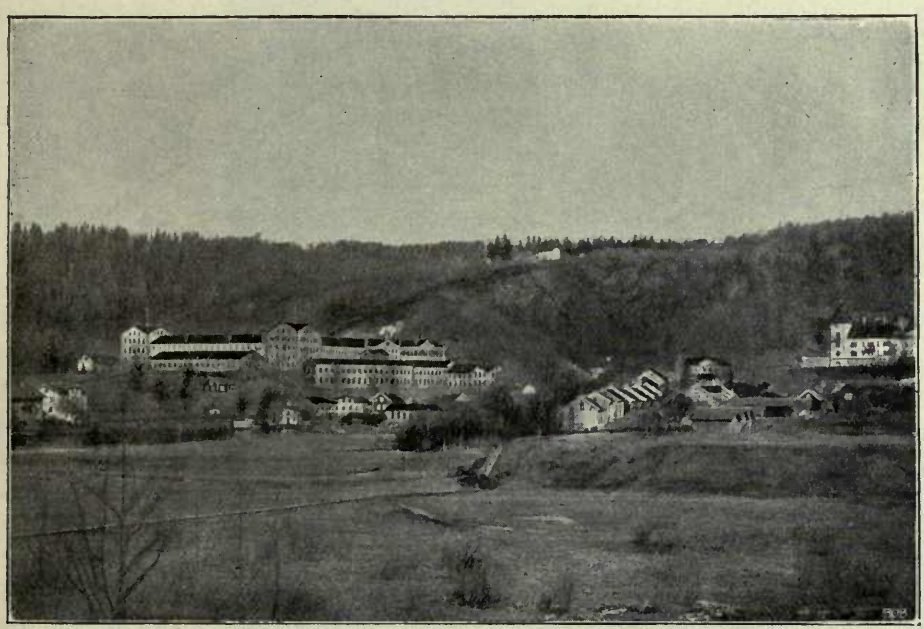
Iron Sponge.

A kind of porous iron called Iron-Sponge is made at Höganäs direct from iron-ore concentrate containing 68 to 70 % of iron in the form of iron-oxide. The method used was invented, by a Swede, Mr. Sieurin. The process is as follows: Layers of concentrate and coal are put in a clay crucible; between each layer of concentrate and coal is a thin layer of lime. The crucible with its contents is then slowly heated in a ring kiln till it becomes red-hot and that temperature is maintained for 10—14 days. The coal is thereby consumed and the concentrate is reduced to metallic iron; the sulphur in the coal is absorbed by the lime. The iron-sponge produced, which is malleable and free from coal, contains about 95 % of iron and about 0.005 % of phosphor, and 0.010 % of sulphur, a little rock, and is used instead of scrap-iron for the production of steel. According to this method, which was not completed until 1911, 3,979 tons of iron-sponge were turned out in 1912.

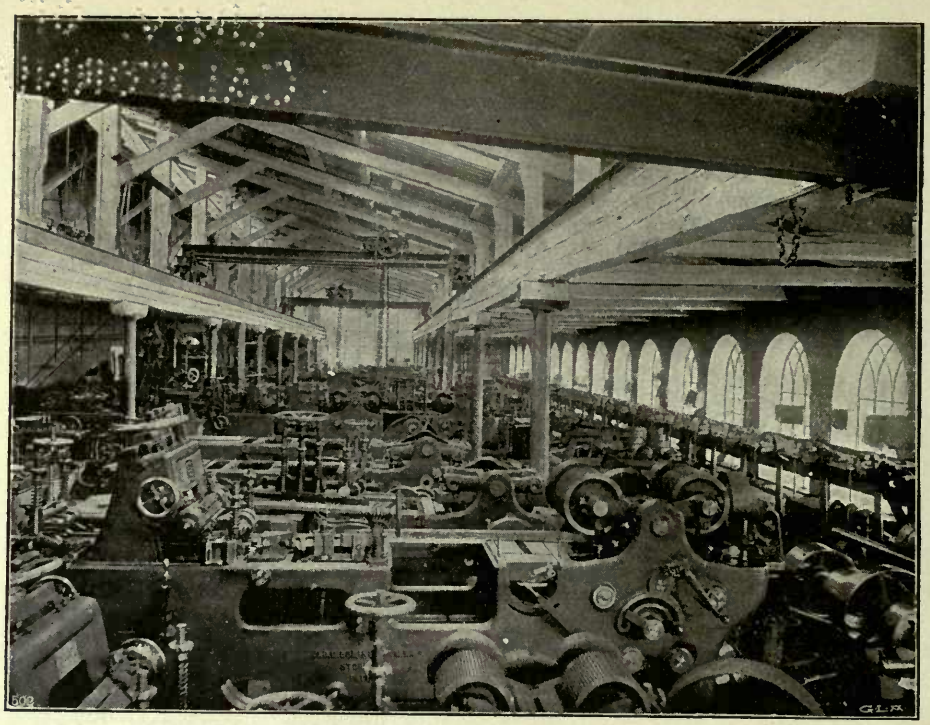
As will be seen from the foregoing, Sweden's iron industry, as regards quantity, is not so large in comparison with other European countries. Nor is the manner of manufacture very unlike that adopted by the steel industry in other lands. These methods have nevertheless had to undergo a very thorough revision in order to enable the production of such high-quality steel that Sweden has always claimed to produce. Broadly speaking, it may be said that for many hundred years the art of metallurgy has been very thoroughly studied in Sweden, and the metallurgic art is combined with a series of Swedish names that are celebrated all the world over. Commencing with Swedenborg and Polhem the Swedish iron industry has been advanced by such prominent men as Rinman, Torben Bergman, Scheele, and Berzelius, and during recent years by Eggertz, Åkerman, Göransson, and Brinell, all of whom are regarded as pioneers. Many are the problems that have been solved concerning mining and metallurgy. One need only call to mind the fact that dynamite is a Swedish invention, and, as mentioned above, that the Bessemer process was technically completed by Göransson, and was afterwards destined to make its triumphal progress throughout the world. It is due to Gröndal's and Sieurin's inventions that two other old problems have been both technically and economically solved, viz., the briquetting of iron-ore in powder form, and the direct production of malleable iron. The first electric blast furnace in the world has recently been completed in Sweden and is in use at several iron-works, and the first electrically driven rolling-plant has seen the light of day in this country. Side by side with these inventions and partly by means of their help the quality of the Swedish steel has slowly but surely risen, so that in spite of all improvements in the manufacture of steel in other countries it has still maintained and defended its position as the finest high-class steel in the world.



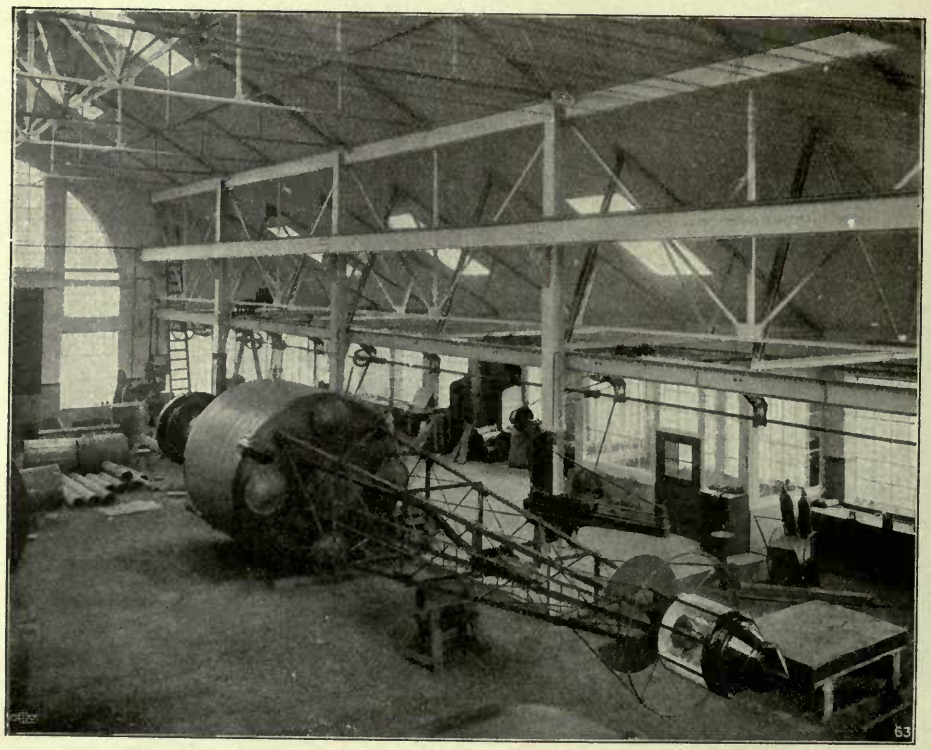
"JERNBOLAGET", ESKILSTUNA,
CUTLERY AND FINE TOOLS



HUSKVARNA WORKS
NEAR JÖNKÖPING



BOLINDER'S MECHANICAL WORKS, STOCKHOLM



WORKS OF THE SWEDISH GAS ACCUMULATOR Co LTD, STOCKHOLM

THE METAL AND MACHINE INDUSTRIES.

This group, which together with the chemical industry (in its widest sense) forms the most important technical industry in Sweden gave employment in 1912 to the following number of factories and workmen, as shown in the table below. The productive value, together with the import and export, are also shown in the table. It should be noticed in connection with these returns that the production of raw material for this industrial group, iron, steel and other metals are not included in the statement.

	Factories	Workmen	Productive value Kr.	Import Kr.	Export Kr.
Iron and Steel Goods	687	24 754	113 071 000	27 957 000	48 991 000
Other metal work	364	6 522	45 721 000	17 507 000	8 490 000
Ships and boats	75	6 252	15 970 000	7 919 000	1 862 000
Carriages and vehicles	90	2 509	13 826 000	3 810 000	2 035 000
Machines and tools	562	28 108	128 461 000	23 467 000	52 497 000
Instruments	74	1 159	4 200 000	4 537 000	759 000
Watches and parts thereof	7	137	220 000	2 765 000	9 000
Total	1 859	69 441	321 469 000	87 962 000	114 643 000
				Deduction for import Kr.	87 962 000
				Surplus production "	26 681 000

The steam engine, which was invented towards the close of the 18th century. was introduced into Sweden in the beginning of the nineteenth and here too revolutionised industrial life. Previously, however, many Swedes, such as POLHEM, RINMAN, NORDWALL, BROLING, etc. had shown the greatest interest in their technical machine branch. A particularly important invention was made in 1826 by L. Lagerhjelm, namely, a machine for testing iron and steel which was the commencement of the, nowadays so indispensable, testing of materials, and without which the complete machine technique of the present day and the building art in all its branches would not have been possible.

Sweden is an extensive but thinly populated country. In 1800 there were only 6 inhabitants per square kilometer and at the close of 1913, not more than 13. Of the whole population 91.3 % were living in the provinces in 1800, and even now in 1914, the percentage is 73.6. Means of communication up to the last decades of the nineteenth century were very limited, and consequently country people had to depend on their own resources for their requirements.

Farmers had themselves to do all the carpentering and forging work necessary for house utensils, as also farming and fishing implements, and indeed they showed much ability in this work. The country people very often produced even hunting guns in their village smithies. In this way mechanical skill was inherited for centuries and has revealed itself in the too numerous mechanical workshops in the country.

The independent machine industry was at first coupled to the iron works, from which the raw material was obtained. With the more general use of the steam engine and the introduction of English tool machines for working the iron, the present machine industry began to make strides in the mechanical workshops and foundries, which were started at the coast towns and in the interior of the country at places favoured with good communications. It was, of course, an advantage to have the aid of waterfalls. This industry has been advanced and developed by such inventors as JOHN ERICSSON, CARLSUND, PALMKRANTZ (machine guns), L. M. ERICSSON (telephone apparatus), PER PERSSON (knitting machines), A. LAGERMAN (complete machines for match factories), J. G. V. ZANDER (motorpathie apparatus), GUSTAV DE LAVAL (the continual separator and steam turbine), GUSTAF DALÉN, the Nobel prize winner (automatic lighting apparatus and light-houses, etc.), the brothers HULT (steam engines, motors, etc.), F. W. LINDQVIST and C. R. NYBERG (petroleum stoves and blow lamps), J. V. SVENSON (petroleum motors), WINGQVIST (ball bearings), etc.

Until the seventies the mechanical workshops were erected chiefly for repair work and for coarser kinds of castings, but in order to keep regular workmen it became necessary to specialize for the requirements of the district and sometimes for distant parts of the country. At the same time as the use of special machines has increased in the older workshops, they have also specialized their manufacture. The most modern workshops have almost exclusively been constructed for the manufacture of certain special machines and apparatus. The Swedish mechanical productions have attracted attention at most of the world exhibitions.

The productive value for the industrial group in question has since 1900 increased from 167,353,000 kr. to 321,469,000, that is to say, it has almost doubled. While in 1900 there was an import surplus of 63,770,000 kr., there is at the present time an export surplus of 26,681,000 kr., so that the Swedish trade balance in this branch has shown a rise of 90,451,000 kr. since the beginning of the present century.

The following list shows the production of the more important articles:

	Kronor.
Various iron and steel manufactures	40 826 000
Castings of pig-iron	27 797 000
Various machine goods	25 301 000
Electric machines, instruments and apparatus	24 905 000
Various goods of other metals than iron	23 156 000
Motors, not electrical or steam	16 972 000
Ships and boats	15 970 000
Special machines for industry and trade not mentioned before	14 352 000
Dairy machines and implements	13 914 000
Other machines and farming implements	13 094 000
Cold-rolled or cold-drawn iron and steel, including wire	9 663 000
Railway and tram cars	8 745 000
Sheet iron and tin goods	8 004 000
Blow lamps and petroleum stoves	7 063 000
Machines for working metals and wood	6 169 000
Galvanising and etching work	5 774 000
Steam boilers, locomotives and locomobiles	5 761 000
Cycles	5 642 000

	Kronor.
Carriages, other than railway and tram	5 081 000
Nails	5 001 000
Castings of other metal than iron	4 912 000
Tubes or pipes of malleable iron and steel	3 922 000
Covered electric conducting wires	3 386 000
Cannons, machine guns, guns and projectiles	2 974 000
Gold and silver wares	2 817 000
Horse shoes, horse shoe nails, and frost nails	2 803 000
Knives and scissors	2 055 000
Chains, cables and wire rope	1 662 000
Joinery manufacture for machines and implements	1 633 000
Saw blades and accessories	1 286 000
Nuts and tyres	1 168 000

The most important articles of import and export within the group are:

Export articles:

	Kronor.
Warm-rolled, cast and rolled metal	17 531 000
Milk skimming and accessory apparatus	13 405 000
Motors for gas, benzine and petroleum	8 342 000
Pipes and Tubes, finished and not finished	8 091 000
Rolled wire from cast and rolled metal	6 911 000
Blow lamps and petroleum stoves	6 753 000
Harvesting, mowing, sowing machines, and threshing machines	5 650 000
Telephone apparatus	5 159 000
Horse shoes and horse shoe nails	2 384 000
Roller and ball-bearings	2 351 000
Sheet iron and tin ware	2 132 000
Machines for working metal and wood	1 834 000
War material of iron and steel, sporting guns, etc.	1 584 000
Water and steam turbines, locomobiles and other steam engines	1 337 000

Articles imported:

	Kronor
Railway and tramway rails	6 637 000
Lead-coated or otherwise protected copper cables and wire-rope	3 836 000
Tubes of iron or steel	3 034 000
Nickeled, or with other surface covering of silver or gold, wares of other metal than iron	2 911 000
Machines for working metals	2 064 000
Scientific and technical instruments, not photographic	1 398 000
Cash control machines, counting machines, and typewriters	1 392 000
Sewing and knitting machines	1 133 000
Blow lamps	1 058 000
Machines for the textile industry	1 009 000

It will be seen from this list of the most important export and import articles within the group that the import requirements are by no means so important as the export. Goods of less than 1,000,000 kr. in value have not been included in these tables.

There is reason to hope that the mechanical industry of the country in general will undergo still greater development since the workshops have begun to specialize their manufactures and since natural sources of assistance have been more fully utilized. In this connection it should be noted that Sweden now builds almost all her war ships herself.

A special branch of industry in this group is the *Eskilstuna Industry*, corresponding to the Sheffield industry of England. This manufacture was commenced in Eskilstuna after the erection and privileging of the so-called free town in 1771. Up to the nineties this trade was chiefly carried on in small smithies, but they produced excellent goods which became famous in foreign countries too. Numerous articles of iron, steel and other metals are turned out, such as knives, scissors, hinges, locks, mountings, hooks and other builders' articles, files, hammers, tongs, gimlets, sawblades, dung forks, spades, household utensils, skates, fancy articles and more recently articles of wholly pressed metal on a large scale, etc. This manufacture has now developed into a great industry in connection with foundries and mechanical workshops, so that the import of such articles from Germany and England has practically ceased. Close to the town lies the arms factory where the weapons for the Swedish army are manufactured.

Together with this the number of factories in Eskilstuna and district in 1913 amounted to 122 with 5,084 workmen and a productive value of 19,614,000 kronor.

THE ELECTRIC INDUSTRY.

The natural resources of Sweden are extremely favourable for the prosperity of an electric industry. Its water-falls are numerous and the enormous deposits of iron ore are well known; its industries in general, especially the mining industry, are extensive and growing.

The Swedish electric industry has its own history marked by a record of prominent inventions. The first inventor was Jonas Wenström who in 1881/82 constructed the first Swedish dynamo for direct current. Wenström was the first to use copper conductors sunk into slots of the armature, a method now used on every electric machine. In 1890 Wenström obtained a patent on his 3-phase motor and power transmission, i. e., simultaneously with Tezla and Dobriwolsky. His patent held good until its expiration and German and American companies had to pay licence to the Swedish inventor when using the patent in his territory.

The inventions of Wenström brought into existence the "Elektriska Aktiebolaget" of Stockholm and for many years the development of the Swedish Electric industry was identical with the development of this Company, which in course of time moved its shops to Västerås and altered its name into "Allmänna Svenska Elektriska Aktiebolaget" or in English "Swedish General Electric Company".

After Wenström's death another prominent inventor, Ernst Danielsson, took charge of the technical department of the Swedish General Electric Company and the industry rapidly developed. The first power transmission was built between Hellsjön and Grängesberg in the year 1893 and was soon followed by the mines of Stripa, Nora Bergslags Company, Trångfors Electric Company &c.

Danielsson took great interest in the electrification of rolling mills and the first electric rolling mill in the world at Boxholm was completed by him in the year 1894. Others, such as Hofors, Fagersta, Surahammar, Söderfors, Domnarfvet &c., followed in rapid succession.

Among inventions mane by Danielsson we mention the tandem connection for three-phase motor and the autosynchronous motor. Other inventions were made: the hysteresis resistances invented by A. Lindström, now professor at the Technical High School at Stockholm and the patent to avoid higher harmonies in the voltage of generators by the same inventor.

The success of the Swedish General Electric Company soon caused competition. In 1892 the Luth and Rosén Electric Company of Stockholm took up the manufacture of electric machines and during 1900 the "Elektriska Aktiebolaget Magnet" (Magnet Electric Company) in Ludvika was started. This latter Company has now amalgamated with another Company under the name of "Förenade Elektriska Aktiebolaget" (United Electric Company).

SWEDISH GENERAL ELECTRIC Co LTD, WESTERÅS

INTERIOR OF WATER- POWER STATION AT TROLLHÄTTAN

During 1898/99 two of the most prominent German firms in the electric line founded daughter companies in Sweden. These do not carry on a manufacture, however. Competition has naturally been great with so many electric concerns and has done a great deal of good in bringing forward new inventions and new development in the line in question.

Parallel with the introduction of higher voltages for the transmission, the development of the water power in Sweden has increased. Among the plants completed after the year 1900 we mention: Dejefors, Frykfors, Yngeredsfors. Gullspång, Graninge, Finnforsen, Lagan &c. The largest power plant in Sweden, however, is the power station at Trollhättan, completed in 1911, which has been visited by a large number of prominent electric engineers. It comprises 8 generators each of 12.500 H. P., and the current is used for electrochemical industry near Trollhättan, for power transmission to all the cities in the neighbourhood as well as to the city of Gothenburg, about 75 miles away.

Great interest was early shown in Sweden for the development of the steam turbine. The prominent inventor Dr. Gustaf De Laval in 1890 devised the De Laval steam turbine which caused much interest at the exhibition in Chicago in 1893 and has been manufactured for numerous plants until recently. The De Laval Steam Turbine Co., in Stockholm as well as other manufacturers in Sweden are now making steam turbines of the modern type. — The first A. C. generator for this type of steam turbines was built in 1907 and for 300 H. P. 3,000 rpm. Already in 1912 such generators for 5,000 H. P. and 3,000 rpm., were being manufactured in Sweden. D. C. generators have been built up to 600 H. P. and 2,000/3,000 rpm.

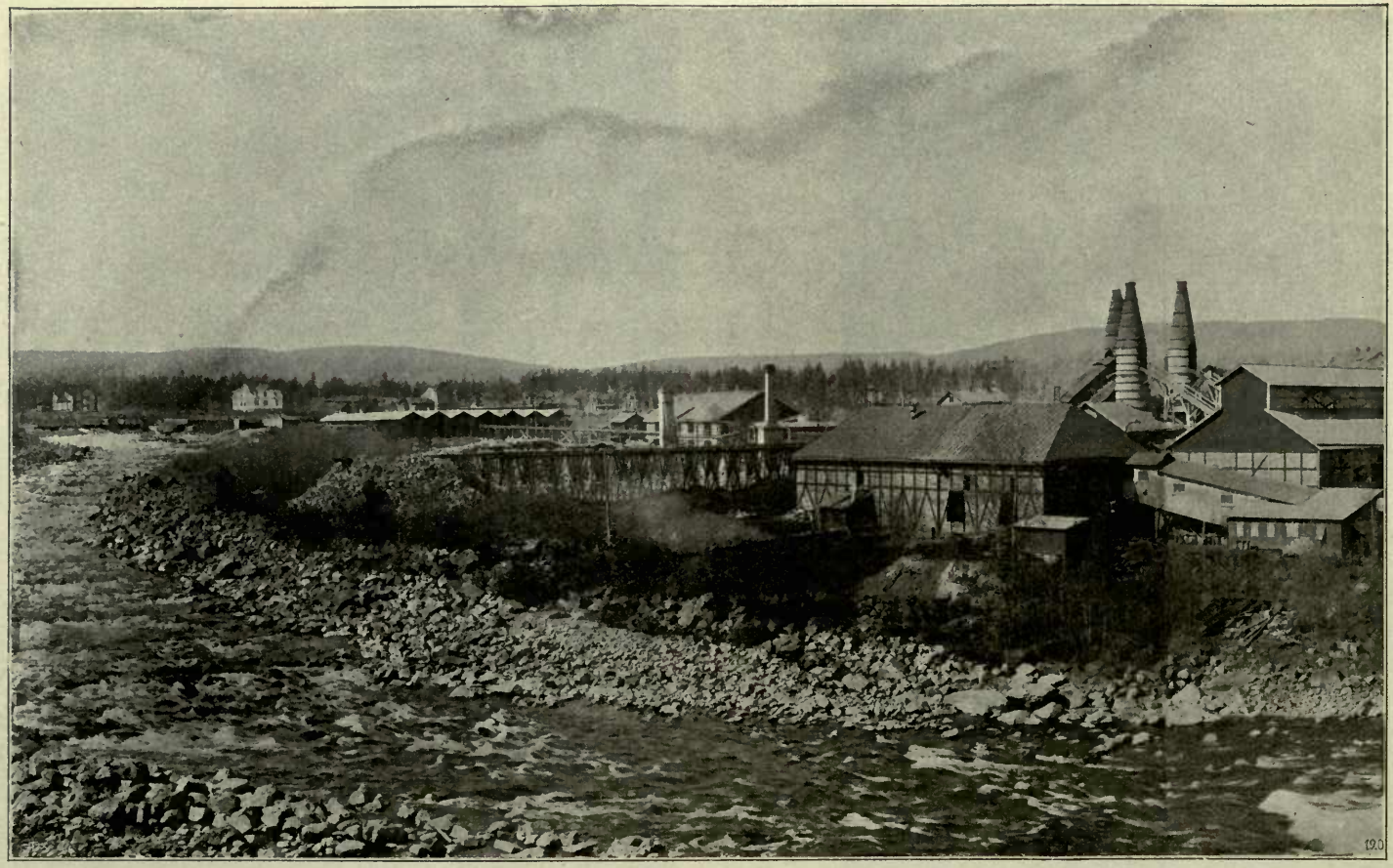
The development of switch gear apparatus has closely followed that of machines and motors, and the Swedish electric industry can at the present date undertake any problem in the way of power development and power transmission.

The building of electric railways has greatly interested the Swedish state which in the years 1904/05 paid large sums for investigating various matters in the way of electrification. A direct result of the work in this direction is that the electrification of the Swedish State Railways has now begun, single phase A. C. current 15 periods being used, the pressure in the working lines being 10,000 volts. The first line, about 90 miles long, has now been electrified between Kiruna and Riksgränsen, and a huge power station has been put in operation in 1914 at Porjus. This power station produces 60,000 H. P., which with a pressure of 80,000 volts is being carried about 130 miles.

Among other electric developments in Sweden we may mention the electric steel furnace by Kjellin and the electric blast furnace invented by Lindblad, Grönwall & Stålhane. The development of the nitrogen industry in Norway is also largely due to the Swedish electric industry, and the greater part of the electric installments for this industry was delivered by the Swedish General Electric Company.

The Swedish telephone industry should be mentioned. It has grown very extensive and, in fact, telephone apparatus, bearing the name of L. M. Ericsson, is now to be found in every part of the Globe.

Other products of the Swedish electric industry are conductors and cables manufactured at the factory of Max Sievert, Sundbyberg, electric incandescent lamps obtained from factories in Stockholm and Nyköping, electric hoists from the factory of Graham Brothers in Stockholm, electric cranes and electro-mechanical combinations from the Mekaniska Verkstaden in Västerås, which latter is owned by the Swedish General Electric Company.



ALBY CARBIDE-WORKS

THE CHEMICAL INDUSTRY

in its stricter meaning is now of considerable importance in Sweden and increasing every year. It is represented chiefly by the following industrial groups in which are included the electro-chemical and that part of the electrothermical industries not belonging to mining. The following are the returns for 1912:

	Factories	Workmen	Productive value	
			Kronor	öre
Inorganic acids, bases and salts	47	375	6 914 000	—
Manures	52	985	12 604 000	—
Explosive substances	21	1 148	7 891 000	—
Colours and different preparations	186	1 361	15 765 000	—
Total	306	3,869	43 174 000	—

The following were the principal products:

Superphosphate	168 000 ton	9 253 000 kr.
Sulphuric acid	127 000 "	2 921 000 "
Nitroglycerine explosives	1 688 "	2 640 000 "
Oil colours, printing colours	—	1 998 000 "
Guncotton	595 "	1 121 000 "
Nitric acid	2 899 "	728 000 "
Bone-dust	5 975 "	564 000 "
Thomas Phosphate	15 000 "	524 000 "

In connection with the above it may be pointed out that Sweden is the classical home of nitroglycerine explosive substances This industry was started by *Alfred Nobel,* who in 1864 established the first nitroglycerine factory at *Vinterviken* near Stockholm. At the same factory are produced dynamite, explosive gelatine and Nobel gunpowder (Ballistit). Ammonia gunpowder and Ballit (Bellona) are also explosive substances invented in Sweden, the latter being free from nitroglycerine. It is composed of dinitrobezol and is quite safe to handle.

Since Sweden has no deposits of common salt nor of potassic salts, there is no manufacture of the important articles soda and potash, and very little sulphate of sodium, hydrochloric acid and chloride of lime; the result is that the productive value of the substances in the above-mentioned groups is proportionally less than that of other countries.

The Swedish artificial fertilizers are celebrated for their careful manufacture. There has been a growing export to Russia during recent years; the exports in 1912 amounted to 58,000 tons.

A group which is allied to the chemical industry embraces the manufacture of *oils, tar, rubber, &c., and their products.* There were 232 factories in 1912, employing 3,692 workmen, and a productive value of 41,771,000 kronor. The principal factories in this group are:

Rubber factories producing	kr.	10 998 000
Soft and other soap factories	"	10 236 000
Oil factories	"	9 605 000
Candle etc. "	"	3 633 000
Varnish "	"	1 733 000
Glue and gelatine factories	"	1 228 000
Wood distilling "	"	1 153 000
Perfume factories	"	1 107 000

The most important article produced from the rubber factories is galoshes and shoes to the value of 8 millions, an industry which has been worked up during the last 20 years or so, to the extent that rubber shoes are now exported to an annual value of about 3 million kr. Swedish stearine candles are particularly famed, and are said to be unequalled in appearance, careful work and burning effect. Swedish perfumes are now taking a prominent place.

Among productions of the chemical industry are the manufacture of *gas and coke* to the value of 13,013,000 kronor, also *charcoal* used in furnaces, which is produced to a value of 137,000 kr., which is not included in the above-mentioned wood distilling factories.

Celebrated for ther artistic and also excellent workmanship are the 8 *porcelain* and *faience factories* employing 2,500 workmen with a production of 5.3 million kr. The two oldest, Rörstrand and Gustafsberg, are famous all over the world.

The *Glassworks* are 60 in number with 5,182 workmen and a value of 11,922,000 kr. The crystal glass manufacture (Reijmyre, Kosta &c.) has become renowned on foreign markets. The greatest export is still, however, in simple table & glassware and decorative glass and also bottles to a value, in 1912, of 4,343,000 kr.

The *Cement Industry* commenced in Sweden in 1871 and has grown to such dimensions that it supplies not only the home requirements but also has an export trade, amounting in 1912 to 127,000 tons. In the same year there were 7 factories and 1,447 workmen, a production of 140,000 tons with a value of 9.6 million kronor. Swedish cement is known in foreign countries for its good qualities. The oldest and largest factory is at Limhamn in Skåne.

The Tanning Industry was at first, and many years, a handicraft with many small factories, inferior working methods and with small productive value per workman. It has now developed into a great industry with fewer factories, less than a third of the number existingl in the sixties, but with seven times greater production per man. Modern methods are now in use and extract-tanning (also chrome-tanning) with a short period of treatment are extensively employed. The quality of the leather has also been maintained and improved in certain kinds.

There were in 1912 32 tanneries (inclusive of fur factories) with 2,358 workmen and a production value of 39.4 million kronor.

Sole-leather and bindsole-leather are turned out in sufficient quantities for the requirements of the country, while there is an annual import surplus of about 10 millions for prepared hides

and skins. The import and export of unprepared hides and skins (not furs) are of similar value (15 million kr. pr annum).

Dyeing, bleaching, cotton printing and cloth finishing works amounted in 1912 to 116 with 2,161 workmen and a value of 5.6 million kronor, of which it may be mentioned that this sum represents only the salaries paid for the work of refining, not the whole value. The factories are generally small, there being only a few larger ones. The most important wool and cotton spinning works are in connection with up-to-date dyeing and bleaching works.

Copper extraction by the wet process is, it is true, included in Swedish official statistics under mining, but it is without doubt a purely chemical industry, and therefore it is mentioned here. At the only extraction works now existing in Hälsingborg are produced 4,503 tons of cement copper and 257 tons of crude ore, 787 kg. silver and 2,25 gold with a value in round figures of 4.5 mill. kr. to which must be added 58,000 tons briquettes of what is known as purple ore, of the value of kr. 500,000, thus to a total value of 5 million kr. in 1912.

The Electro-Chemical Industry in Sweden, thanks to the numerous waterfalls and in spite of unsuitable legislature as regards their use, has gradually been worked up so that in 1913 80,000 electric H. P. was used with a production of about 20 million kronor. In this is included the electro-thermical manufacture of iron, iron alloys and zinc, but not the galvanic industry.

Chlorate. The oldest production from this industry in Sweden is chlorate of potassium, in connection with which other chlorates and perchlorates are manufactured, the latter for the preparation of explosive substances. In two factories, Månsbo and Alby, there were produced in 1912 3,418 tons of chlorate and perchlorate with a value of 1.9 million kr. for the production of which 5,750 electric H. P. were used. In 1912 1,653 tons of chlorate were exported to a value of 794,000 kr.

Calcium carbide and calcium cyanamid (nitrogen-calcium). There are three factories for the production of these substances with althogether 29,650 electric H. P., corresponding to a production of about 45,000 tons of carbide or circa 60,000 tons of nitrogen-calcium if the whole power is utilized, which is not the case at the latest factory at Ljungafors. In 1912 11,120 tons of calcium carbide were manufactured to the value of 1.7 mill. kr. and as a refined product of a part thereof, 6,044 tons of nitrogen-calcium to the value of 862,000 kr. Of these substances 1,256 tons of calcium carbide and 4,056 tons of nitrogen-calcium were exported in 1913 to a total value of 1.1 million kr.

In connection herewith it may be mentioned that there is at Ljungafors a small works for *nitric acid* according to the Birkeland-Eydes method.

Alkali and bleaching powder are produced on a smaller scale at Bengtsfors with 400 electric H. P. and a production of 900 tons of bleaching powder and 250 tons of caustic soda and potash to a total value of 225,000 kr.

Hyposulphite of sodium is produced through electrolysis of common salt for bleaching wood pulp at Billingsfors. 400 electric H. P. are required annually for bleaching 4,000—5,000 tons chemical wood pulp.

Bicalcic-phosphate with a percentage of 35 % phosphoric acid has been manufactured experimentally at Trollhättan, but no great technical use has yet resulted.

To produce oxygen gas and hydrogen gas electrically at present 35 electric H. P., are required.

Galvano technics for plating, guilding, nickel-plating and for making clichés is employed to some considerable extent in Sweden. There are no official returns, but the production is probably of the value of about 1 mill. kr.

The productions classified under the heading of chemical and electro-chemical industries, after making allowance for certain double calculations which could not be avoided in the statistics, amount to a value in round figures of 168 millions for 1912. These significant figures are even more striking if they are compared with the iron and steel trades, which when double calculations are avoided, have a value of about 144 million kr. for the same year.

At the same time the following figures should be considered:

Refined sugar industry, less duty	in	round	figures	kr.	53 055 000
Spirit industry, less duty	"	"	"	"	13 317 000
Malt liquor brewing, less duty	"	"	"	"	35 669 000
Chemical wood pulp	"	"	"	"	95 704 000
Paper and cardboard	"	"	"	"	65 139 000
Matches	"	"	"	"	16 573 000
				Total kr.	279 457 000

These products belong without question to the chemical industry. Added to the first stated value a total sum of 457 million kr. in round figures is obtained, thus three times greater than the iron industry and ore export together.

ALIMENTARY ARTICLES OF FOOD AND LUXURIES.

The value of Sweden's production of alimentary articles of food and luxuries forms about 28% of the whole industrial manufacture and is distributed for 1912 in the following way:—

	Factories	Workmen	Value of manufactures Thousands of kronor
Grain and root products	1 744	7 769	155 042
Dairy produce (1910, returns are issued only every five years)	1 416	4 145	95 454
Different alimentary substances from the animal world	118	1 911	49 204
Sugar, chocolate and tobacco	292	16 007	165 094
Beverages, etc.	1 186	8 019	106 802
Total	4 756	37 851	571 596

Import and Export of the products in question have been:

Yearly	IMPORT. Value in 1 000 kr.				EXPORT. Value in 1 000 kr.				Import Balance in 1 000 kr.
	Farm or fish produce	Colonial produce	Other articles*	Total	Farm or fish produce	Colonial produce	Other articles*	Total	
1871—75	36 876	37 101	10 950	84 927	43 759	72	492	44 323	40 604
1876—80	55 593	44 076	8 939	108 608	48 846	97	1 143	50 086	58 522
1881—85	62 436	40 604	13 110	116 150	47 803	177	2 274	50 254	65 896
1886—90	46 036	50 115	12 151	108 302	58 879	691	3 437	63 007	45 295
1891—95	50 304	47 688	12 071	110 063	74 480	1 136	1 203	76 819	33 244
1896—00	61 224	40 952	17 073	119 249	53 362	301	1 375	55 038	64 211
1901—05	84 462	39 260	20 702	144 424	46 884	468	2 509	49 861	94 563
1906—10	79 880	44 759	21 031	145 670	52 894	568	2 739	56 201	89 469
1910	77 121	47 579	23 216	147 916	61 642	462	2 145	64 249	83 667
1911	69 450	59 479	24 301	153 230	78 322	938	1 958	81 218	72 012
1912	91 720	60 306	26 328	178 354	88 404	752	1 603	90 759	87 595

* Fruit, garden produce and beverages.

During the years 1841—80 the country had a surplus of grain beyond its requirements, but since then, owing to increased consumption, in spite of much greater cultivation, there has been a shortage, so that there is an import surplus of grain and other productions of a value of 40.5 million kronor. Among colonial produce coffee occupies the first place in 1913 with a value of 45 million kronor; (tea is drunk only to an inconsiderable extent.) In the above table the balance is reduced through an export surplus of live-stock which amounted in 1912 to 13.4 millions, but is increased through an import surplus of 25.5 millions, obtained from fodder.

Sweden's principal export of provisions is animal products amounting in 1912 to 83.4 million kr. of which sum butter, cream and milk represented 49.9 millions, meat and pork 17.9 millions, fish 12 millions and eggs 2.7 millions.

The milling industry was during many decades carried on almost exclusively by means of water and wind power in many small mills, principally in the provinces; nowadays the greater part is done by steam mills in the towns. There were in 1912 259 flour mills in the provinces employing 2,346 workmen and with a production of the value of 416 million kr. against 97 mills in the towns with 1,267 mills and 76.6 million kr., forming a total sum of 118.2 millions. The same year the surplus import of mill products was 6.6 million kronor.

The yearly consumption per head in Sweden of grain (rye and wheat) is 190 kg. per annum, of milk about 200 kg., and of butter 7.5 kg.

The *Sugar industry* until the 1880 decade consisted almost entirely in the refinement of cane sugar; now the industry is confined only to home beet sugar. So early as about 1830 unsuccessful attempts were made to cultivate sugar beet and again in 1870; but, it was not before the eighties that beet cultivation made any real progress; at the present time, thanks to the imposition of a high protective duty, the country is able to supply its own requirements of sugar.

Sugar beet grows well in Sweden, especially in the province of Skåne, where the *beet crop* yields an average of 30 tons per acre (27 tons for the whole kingdom) compared with Germany which produces 30.8 tons and France 26.5 tons. Skåne produces 83 % of the whole crop in Sweden. *The quantity of sugar* per acre is 400 kg. in Sweden, 450 kg., in Germany, and 330 kg. in France, and the *percentage of sugar* is respectively 15, 15.6, and 13.4 %. Sweden thus occupies a leading place in the cultivation of sugar beet in respect to quality. The beet cultivating area has varied during the last century between 20,000 and 33,000 hectares with a crop of from 825,000 to 1,105,000 tons of beet obtaining at present 25.60 kr. per ton at the raw sugar factories (24 in number). It is generally worked on the diffusion method.

The productiou of raw sugar in the working year 1911—12 was 127,378 tons at a value of 43.6 million kr. The cultivation of beet has great importance both directly and indirectly for farming in Sweden; it returns a profit of some 500 kr. per acre, assists in cultivating the land through strong manuring, deep ploughing, ridding the ground from weeds, and provides the agricultural people with good work. The industry and communications of the country thus benefit greatly by this cultivation.

There are 10 *Refineries* with a production of 123,163 tons of prime refined sugar, 3,281 tons of syrup and 6,805 tons of molasses forming a grand total of 73.6 million kr.

In addition to revenue duty a tax on the quantity of beet produced has been imposed on Swedish sugar; after 1906 the tax was on the production, and now forms 16 öre per kg. The duty on refined sugar is now 11 öre per kg. and 8 öre on raw sugar. The State receives yearly about 19 million kr. from the sugar tax.

The yearly consumption of sugar in Sweden is now 38,7 kg. per head and is greater than in Germany and France, but owing to the higher duty less than in Denmark, England, The United States etc.

There is a considerable production of *margarine*. In 1912 there were 8 factories with 22.3 million kg. and a value of 24.5 million kr. The principal ingredient is what is known as vegetable margarine, prepared from pure cocoanut oil and other edible oils. The import and export of margarine is inconsiderable. The manufacture at each factory is under the supervision of a goverment inspector whose duty it is to see that only fresh raw materials and hygienic working methods are employed. The greater part of the raw material for this industry has to be imported. Of similar articles, artificial grease is manufactured to an amount of 1.6 million kr.

The consumption of margarine and artificial grease etc. amounts to 3.8 kg. per head annually.

Among other manufactures the following food products may be mentioned:

Bakeries and biscuit manufactories	kr.	22 599 000
Pig slaughtering	"	11 244 000
Charcuterie manufactories	"	10 713 000
Caramel, jam and marmalade factories to a manufactured value of	"	9 133 000
Coffee roasting and coffee substitutes factories	"	6 269 000
Chocolate factories	"	5 579 000
Starch and starch sugar factories	"	3 458 000
Yeast factories	"	2 781 000
Fish curing establishments	"	2 780 000
Preserve factories	"	1 080 000
Macaroni and sago factories	"	897 000
Vinegar factories	"	617 000

Manufacture of Spirits.

After having been formerly a by-product to farming, the manufacture of »brännvin» (gin) became a separate industry at the end of the seventies; most of the industry was carried on in the south of the kingdom. The raw materials used in the manufacture are principally potatoes and grain (some molasses and sugar beet). During the working year 1911—1912 1,506,000 hectoliters potatoes and 16,990 tons of grain were consumed, resulting in a product of respectively only 7.3 and 0.66 % of the corresponding crop. The loss of nutrative value involved by the preparation of gin is of little economic value. In the same year was produced a quantity of 402,152 hectoliters raw gin and spirit (including sulphite spirit, see below) calculated on 50 % of alcohol, a quantity which has been steady since 1906.

The tax on the manufacture of gin is very high, at present 65 öre per litre and 50 % of alcohol not including the selling charge. The period of manufacture is generally from October to April; an inspector is appointed for each manufactory. The measurement of the spirit obtained is effected by means of automatically sealed apparatus which not only registers the number of litres obtained but also reduces them to litres of normal strength (50 %). A certain number of distilleries are under the control of inspectors who have the right to open, examine and adjust the control apparatus.

The greater part of the gin consumed is purified by redistilling and coal filtration which is effected in special purifying works; there were in 1912 9 such works with a production of 252,872 hectoliters (50 %).

A product which is peculiar to Sweden is *sulphite spirit.* This is produced by the fermentation of the waste lye resulting from the manufacture of sulphite wood pulp. The manufacture in 1912 amounted to 44,287 hectoliters sulphite spirit, used exclusively for technical purposes.

In the same year 69,000 hectoliters spirit (50 %) were denaturated so that 368,805 hectoliters were used for consumption. Inclusive of imported spirits (not including wine) the yearly consumption per head of 50 % alcohol is 6.7 liters, a quantity which is less than in most countries. Sweden is thus one of the most abstemious countries and the consumption of all kinds of spirits decreases year by year.

A beverage which is peculiar to Sweden is *punch* which is prepared from arrack, sugar and water, containing about 25 % of alcohol. The production amounted in 1912 to 31,833 hl.

Malt liquor has been made in Sweden since the earliest times until 1840, when the Bavarian method was introduced, principally home-brewed; now it is a high standing manufacturing industry. Beer and Porter are delivered only in bottles. There are in Sweden, partly, duty free malt liquors with a maximum of $2^1/_2$ vol. % alcohol, partly, those subject to duty for which the revenue is received from the malt tax, on an average 30 öre pr kg., made principally of home-grown barley. The malt tax for the working year 1911—12 amounted to 938,000 kr. Only barley malt may be used for beer subject to duty, hops (imported from Bohemia and Bavaria), yeast, water and under certain conditions sugar colouring; for porter also sugar and glucose are employed. Saccharine is forbidden in all malt beverages.

During 1911—12 33,026 tons of malt were used, 437 tons of hops, 205 tons of sugar colouring, and 314 other substances containing a percentage of sugar. The consumption of malt corresponded to 15 % of the Swedish barley harvest.

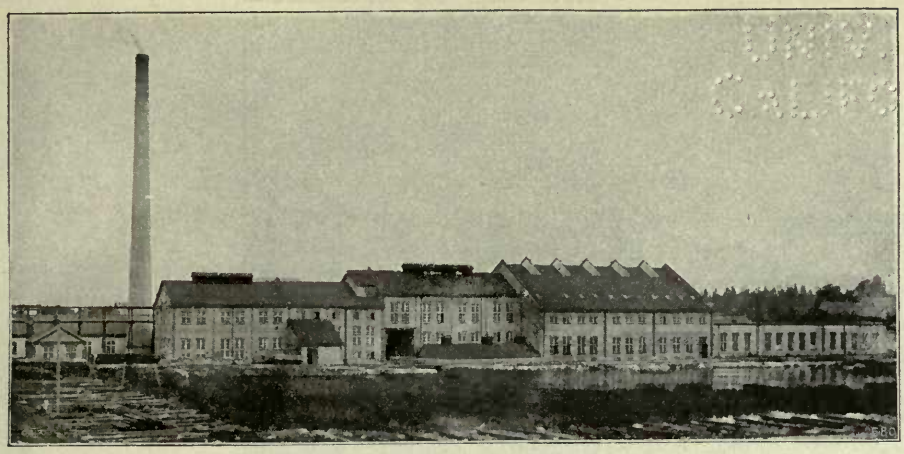
The consumption of malt and spirituous beverages decreases from year to year owing to the temperance movement; in 1911—12 946,639 hl of beer and porter were consumed, equalling 17 hl. per head annually; this is less than in most countries. The other malt beverages have only the character of non-alcoholic drinks.

Mineral and non-alcoholic drinks (not malt beverages) were manufactured under satisfactory conditions in 250 factories. The consumption equalled 22.4 million litres or 4 litres per head per annum, with a productive value of 4 à 5 million kronor.

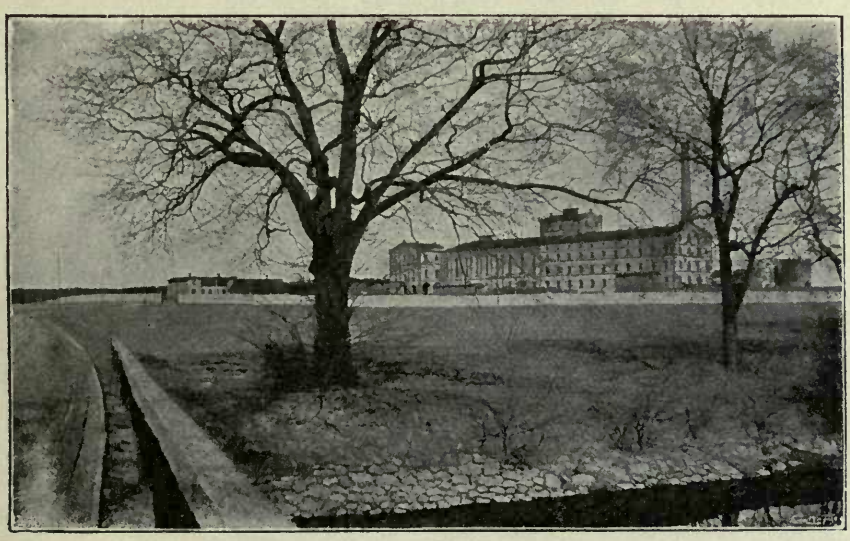
Tobacco was first heard of in Sweden in the year 1639, and was first cultivated in 1750; it is mostly grown in the south of Sweden. In 1911 the crop was 706 tons from about 400 acres. Swedish tobacco has a peculiar smell different to the finer foreign kinds and is therefore only used to a small extent with imported tobacco for blending in the manufacture of cheap cigars and snuff.

The imports amounted in 1912 to 4,496 tons raw tobacco and 558 tons of cigars and cigarettes, 338 tons of smoking tobacco, 556 tons rolled and pressed tobacco and 6,394 tons of snuff (used chiefly for chewing) to a total value of 23 million kronor. The consumption of tobacco is increasing and amounts annually to 15.7 hektogram per head.

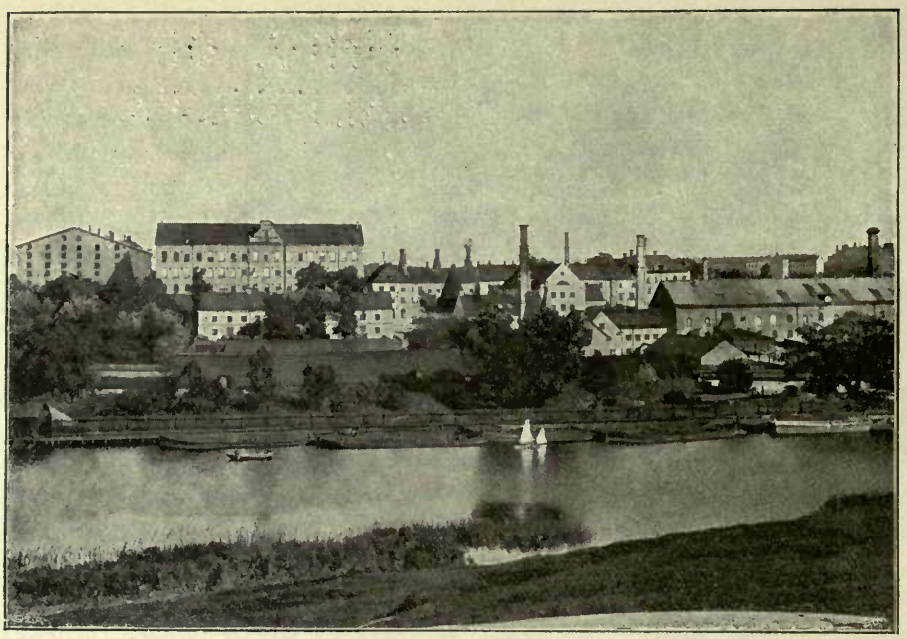
The duty on unprepared tobacco is 1 kr., on cigars and on cigarettes 4 kr., and on other kinds 1.20 kr. per kg. The manufacture of tobacco is now a State monopoly.



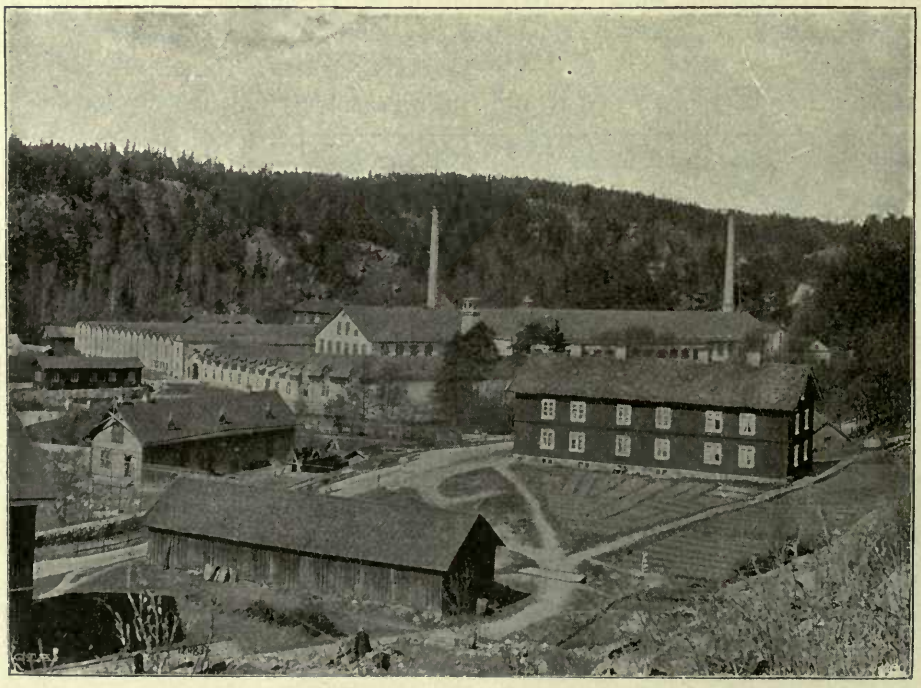
LESSEBO PAPER-MILLS



SUGAR MILL
AT KARPALUND, SKÅNE



RÖRSTRAND CHINA WORKS



WISKAFORS COTTON-MILLS

THE TEXTILE AND CLOTH MANUFACTURING INDUSTRIES.

IN Sweden it is possible to refer to the existence of a textile industry even as far back as the early part of the seventeenth century. At that early period the trade was chiefly in connection with the army requirements for cloth and linen, and the first great enterprise in the branch seems to have been undertaken by a wool and linen factory established in Jönköping in the year 1616. The prolonged wars in which the country was engaged during different periods of the seventeenth and the first decades of the eighteenth century laid low her industrial life, and when Sweden's career as a great power came to an end in about the year 1720, the textile industry, which had attained a certain distinction, especially during the peaceful reign of Charles XI, was almost paralyzed in consequence of lack of capital and the inability to obtain a market. After peace had been restored to Sweden it naturally became the keen and fervent desire of the leaders to reinstate the national welfare and on account of the mercantile system then in vogue efforts were above all made to create resources hy re-establishing and developing industrial life. With the substantial help which the State offered in the form of advanced capital, premiums, discount loans, monopoly on manufactures, import prohibition, etc., etc., a quantity of industrial enterprises soon cropped up which were intended to make the country independent of foreign manufactures. The enterprises alluded to above, with reference to their character, generally belonged to the textile industry which thus became the first real factory industry of importance in Sweden. Together with the manufacture of wool the weaving of simple kinds of silks and other stuffs had already been adopted in the seventeenth century. Both these branches met with great success and certain new manufactures made their appearance such as, for instance, the weaving of cotton-cloths, linen, woollen goods and the manufacture of ribbons.

Various difficulties of a technical and economical nature, however, were the cause that the united efforts of State and private industrial men to assist and support the country's industry, were for the time being but partially successful. Of these difficulties may be mentioned the lack of skilled labour, an insufficient supply of wool, the disinclination of the public to buy Swedish factory products, an inefficient customs service which rendered possible the smuggling of foreign spinning wool, the limited supply of capital and in connection therewith the difficulties experienced in collecting the working-capital necessary for the industry. During the turbulent years at the close of the eighteenth and the beginning of the nineteenth century there was also the impoverishment of the country through continual wars and in consequence thereof the dissolution of the coinage and a state of paralysis in public business. It was not before the consequences of the afore-mentioned state of general debility were to some extent overcome between 1830—40, and inventions within the sphere of mechanical engineering and the transport system which made a rational factory industry possible, that there was reason to assume the probability of a distinct up-

ward tendency in the textile industry. During the course of the nineteenth century such an upward tendency has been more and more apparent in such a way that the old branches of manufacture, apart from temporary stagnation or decline, both as regards quality and quantity have considerably increased their production, at the same time that new kinds of factories have gradually made their appearance, such as for instance jute factories, curtain factories, hat and cap factories, factories for millinery ware and other needle-work factories. Since the beginning of the nineties the textile and cloth-making industry especially has developed with the greatest speed and energy, to which protectionism, which was introduced during that decade, may be considered to have partly aided, even though the most important reason was, of course, the general rise in public economical affairs that characterises Sweden's industrial life during the last few decades.

Concerning the extent of the Swedish textile and cloth-making industry and the conditions under which the manufacture is carried on, a special investigation was made in 1912 by The Royal Commerce and Industry Department from whose report a few of the most important statements will be found here below. According to the investigation then made there were altogether 428 concerns of the nature of a factory, in the textile and cloth-making industry. The investigation does not, however, comprise all these enterprises as some few firms have been prevented from giving the reports necessary for such an investigation. This, however, has not substantially affected the results obtained.

Of the 428 factories 288 were working in *the textile industry proper*, in which is included the spinning and weaving industry, as also factories producing knitted goods, curtain and ribbon factories, rope-works and twine factories, colour works, printing works, bleaching and cloth finishing works. Concerning the manufacture and turnover of the textile industry proper see the following summary.

The Production of the Textile Industry Proper.

1	2	3	4	5	6	7	8	9	10
Factories	Costs for Material	Costs for Extra Help	Costs of Sales and Freights	Wages	Interest	Annulments and divers expenses	Year's Profits	Total	Value of manufactured products
	Kr.	Kr.	Kr.	Kr.	Kr.	Kr.	Kr.	Kr.	Kr.
Wool Spinneries ...	632 473	31 610	29 414	176 042	28 326	56 443	40 205	994 513	301 016
Worsted " ...	7 397 741	165 958	196 813	785 727	132 399	241 624	193 590	9 113 852	1 353 340
Woll Weaving Mills	6 546 681	343 872	416 714	1 371 073	342 979	338 419	299 160	9 658 898	2 351 631
Combined Wool Factories	19 725 961	229 855	1 798 022	7 850 694	1 522 688	1 805 832	1 298 325	34 231 377	12 477 539
Vigogne Spinneries	1 456 555	—	61 498	382 556	69 338	118 053	60 220	2 148 220	630 167
Cotton "	6 669 812	97 318	295 838	1 132 361	159 651	535 972	480 790	9 371 742	2 308 774
" Weaving Mills	9 707 744	489 293	673 034	2 895 387	367 482	1 126 455	1 343 408	16 602 803	5 732 732
Combined Cotton Factories	19 066 233	710 017	2 400 005	6 940 635	1 321 292	2 451 025	2 227 401	35 116 608	12 940 353
Linen Weaving Mills	547 896	—	55 660	148 774	7 429	76 576	56 773	893 108	289 552
Combined Linen Factories	3 636 865	51 264	660 051	1 445 314	211 173	419 497	319 710	6 743 874	2 395 694
Jute Factories	3 109 436	2 102	302 033	1 181 989	130 560	289 659	314 215	5 329 994	916 423
Factories for Knitted Goods	8 571 110	86 694	566 185	3 640 758	301 836	962 724	819 868	14 949 175	5 725 186
Curtain and Ribbon Factories	3 253 641	34 621	403 454	1 246 421	132 494	310 471	374 801	5 755 903	2 064 187
Rope and Twine Works	1 669 714	1 489	109 391	405 979	56 786	158 956	100 199	2 502 514	721 920
Colour and Printing Works, etc.	2 070 169	12 301	172 742	1 023 213	125 053	375 040	216 798	3 995 316	1 740 104
Total	94 062 031	2 256 394	8 140 854	30 626 923	4 909 486	9 266 746	8 145 463	157 407 897	52 948 618

The total turnover for the textile industry proper for the year 1912 according to the report amounted to 157.4 million kronor. Of this amount, however, no less than 104.5 million kronor was used to cover the expenses of material, extra help, sale costs and freights. As costs of material have in this connection not only been regarded as costs for the material itself but also for fuel, power, lighting, articles necessary for the manufacture, chemicals, etc., etc. If the last-mentioned sums were subtracted, there would remain about *55 million kronor*, in the table under the heading of "*value of manufactured products*" which includes the expenses of the industry in the way of wages, interest, writing-off, debts, insurance fees, costs for maintenance and repairs, etc., etc., together with the year's profit which is all to be regarded as the increase in value of the consumed material through industrial activity.

The *Estates* accounted for by the textile industry proper possessed a taxation value in round figures of 66 million kronor, of which 55 millions is for factory buildings and economy buildings, 8 millions for dwelling houses and administration premises and for the workmen, and 7 millions for the plot-ground especially taxed. *The machinery and fixtures* for the factories were insured against fire for 77 million kronor.

The Assets and Liabilities of the textile industry proper balanced in the year 1912 with 243.3 million kronor. Of this sum 220.3 million kronor, or about 91% referred to enterprises administrated as limited liability companies and the remainder to private owners.

The investigation of The Royal Commerce and Industry Department referred to above has, as previously intimated, included besides the textile industry proper also the *cloth making industry* as also various classes of small factories belonging to the industry in question. Altogether 140 firms carrying on factory businesses have been included in the investigation in this connection. With the exception of some small concerns that have failed to send in their reports, the year's production of the various classes of factories appeared as shown in the table below.

The Production of the Cloth Making Industry, etc.

Factories		Factory utensils, fuel, power, and lighting Kr.	Workmen's wages Kr.	Other expenses and profit Kr.	Production for the year Kr.
Hat and Cap Factories	3 279 430	175 766	1 393 758	2 533 319	7 382 273
Factories for Millinery	7 090 282	110 151	3 438 345	3 869 448	14 508 226
Linen, Drapery, and other Factories for sewing	2 899 802	149 700	1 300 737	1 567 591	5 917 830
Factories for Cotton wool, Shoddy, and Cotton waste	1 136 528	45 560	197 937	293 401	1 673 426
Factories for Umbrellas, etc.	394 632	4 917	89 289	152 878	641 716
Various factories	985 157	94 964	213 184	765 036	2 058 346
Total	15 785 831	581 063	6 633 250	9 181 673	32 181 817

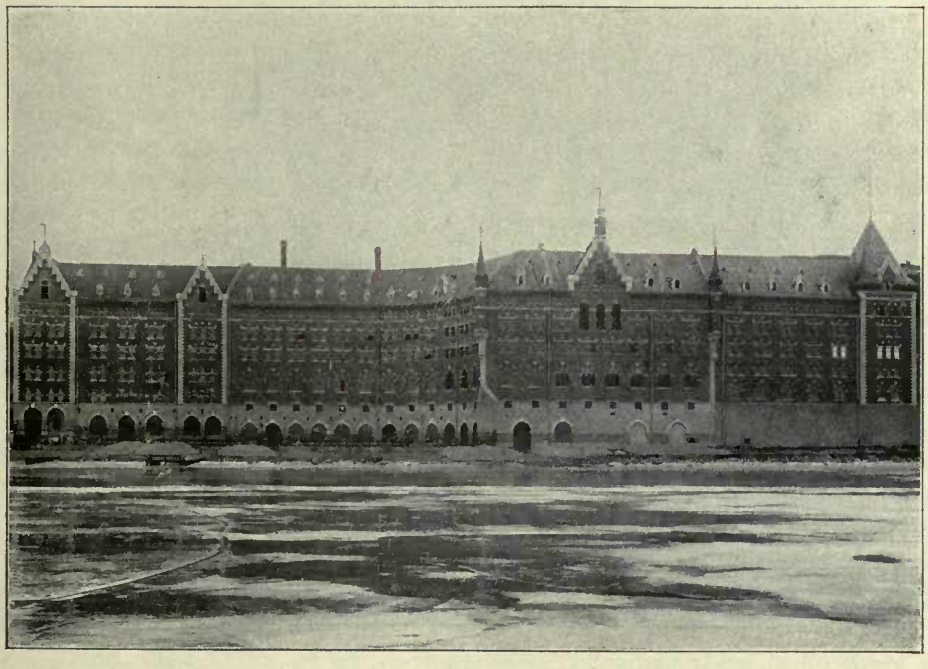
Of the value of the year's production, namely, 32.2 million kronor, about half or 16.4 comprised the purchase value of the material, fuel, utensils, etc. The balance of 15.8 million consequently signified *the value of the manufactured products*, or the increase in the value of the material as a result of the industry.

The *Estates* used by the cloth making industry were taxed at about 10 million kronor. The fire-insurance value of *machinery and fixtures* was given at 4.7 million kronor—therefore the entire foundation capital should be reckoned at 15 million kr.

The total *balance figures* for cloth making firms showed a sum of 34.4 million kronor. Of this amount 77 % referred to limited liability companies.

At the close of the year 1912 the number of employees on the *administration staff* in the cloth industry was reported to be 2,979, of which 1,806 were engaged in the textile industry proper, and the remainder were in the service of cloth-making firms, etc. The costs of administration, in the shape of salaries, commission, directors' and auditors' fees amounted, for the first-mentioned group of factories to kronor 5,655,000, and for the latter group to kronor 2,521,000. During the period just referred to there were 47,989 *factory-hands* occupied in the factories in question, namely, 37,225 in the textile industry proper and 10,764 in the cloth industry, etc. These figures include outside hands (such as work at home). The special figures given in this connection were 2,392 for the first-mentioned group of factories, and 2,787 for the latter. The Home hands have preferably been given knitting and sewing work. During 1912 altogether kronor 24,868,000 was paid in wages to hands engaged in the textile industry proper, of which kronor 468,000 went to home-workers. Clothmaking factories paid kronor 5,633,000, of which kronor 1,329,400 was received by home-workers.

GOTHENBURG HARBOUR. GENERAL VIEW



GOTHENBURG HARBOUR. WAREHOUSES

STOCKHOLM HARBOUR

COMMERCE AND SHIPPING.

Although Sweden, on account of her geographical position, does not possess the qualifications essential for as prominent a position in commerce and shipping, as for instance, The Netherlands, holding as she does the keys to the estuaries of the Rhine, Great Britain thanks to her insularity, or Denmark in consequence of her happy position between the Baltic and the North Sea, being the Northern outpost of the Continent of Europe, she has, however, even in this respect been blessed by nature in more ways than one. From time immemorial down to the present day, wealth of interior water-courses, navigation routes protected by various archipelagoes, rivers and extensive lakes have substantially assisted in extending material cultivation throughout the country, and have facilitated the exchange of merchandise between her various parts, whose inhabitants, owing to the great extent of the country from North to South carry on their pursuits under very varying climatic conditions. Ages ago when almost impenetrable forests and insurmountable mountain ridges placed difficulties in the way of communication, cultivation especially chose the river dales and lake valleys as her path of progress. By means of extensive canals these natural water-courses have been connected with each other and further developed. In Sweden just the same as in other countries, through the development of country roads and the advent of the railway, the importance of water-courses has relatively become reduced, but during recent years attention has again been directed to the value of this means of communication which must be of especial value to a country whose products are so bulky, as those of Sweden, and therefore could not bear heavy transport expenses. The long coasts of this country, rich as they are with good harbours, and her position in the centre of Northern Europe have been of the greatest importance for her international trade.

The ethnical foundation of a nation is equally important to its economical development as its geographical position; the inherited aptitude and natural disposition of a people for one kind of occupation or another. It has been said, and perhaps with a certain amount of truth, that the Swedes have not been favoured by nature with a special talent for commerce; that their strength lies more in the technical professions, in the production of the goods themselves than in the deliberate calculation that is the qualification necessary for rational and profitable sale. Efforts have, however, recently been made to rectify matters in this connection by providing a thorough and comprehensive training in economical affairs, to give the nation the competitive force that is needed in view of the great increase in its manufacturing industries.

And then again, as far as shipping is concerned there is no doubt that psychological qualifications exist in abundance. Ever since the days of the Vikings the sea has been one of the strongest attractions to the Swedish temperament, and Swedish seamen, brought up

among the islands fringing the coast, enjoy the highest reputation in all the commercial fleets of the world. It is true that the important position occupied by Swedish shipping years ago was considerably lowered during the close of the last century owing to a concurrence of various circumstances, but the last few years have brought about a period of almost incredible progress. In a very short space of time the Swedish flag has succeeded in gaining an honorable position in trans-oceanic shipping and may now be seen in the most distant ocean highways, from South America to East Asia, from the United States of America to South Africa and Australia. This new lease of life to Swedish Shipping is one of the most characteristic features in the modern economical history of the country, and its reactionary influence on other phases of economical life begins to be more and more evident.

Sweden's commerce and shipping has for centuries been the object of the most interested attention from the public, and has enjoyed support and encouragement even though during the course of time opinion has considerably changed regarding the question as to what extent it be suitable for the State, by means of positive measures in some form or another, to intervene in the free development of the country's industrial life, and the industrial policy of the State in accordance herewith has from time to time appeared in varying forms. *Kungl. Kommerskollegium* (The Royal Commerce and Industrial Department) has existed ever since the dawn of the period when Sweden occupied the position of a great power, namely, from the middle of the seventeenth century. The object of the Board of Trade is to guard the interests of Sweden's commerce, industry, and shipping. Rules and Regulations for this department came from the pen of Axel Oxenstierna. In the near future the Board of Trade will probably undergo a radical reform in connection with which commerce and industry will in all probability be represented by their own minister in the government, instead of by the minister of finance as hitherto.

A "council of commerce" consisting of seven members, meeting under the chairmanship of the Secretary of State for Foreign Affairs or the Minister of Finance, acts in the interests of commerce and shipping. There are also various organizations founded by industrial men themselves in the form of chambers of commerce and similar institutions.

Among the measures taken by the State for the benefit of the country's industry attention should at first be directed to such as are intended to provide *professional training*. Commercial instruction in Sweden is, it is true, attended to by private undertakings but the State gives substantial support to four "Commercial Institutes" in Stockholm, Gothenburg, Malmö, and Helsingborg, and also to the Commercial High School opened in Stockholm in 1909. To render it possible for promising pupils to continue their commercial studies in a practical form abroad, the State gives a sum of Kronor 20,000 annually to be distributed as stipends for commercial study. Instruction in matters appertaining to shipping is in the hands of navigation schools (in Stockholm, Gothenburg, Malmö, Hernösand, and Calmar) for the training of officers for the commercial fleet. A considerable part of the expenses in connection with this instruction is defrayed by the State.

To work for the *advancement of the country's export* in every possible way still continues to be an object, which most countries consider an affair of the State, even though one no longer sees (as was the case during the sway of mercantile theories) in a "favourable commercial balance" the much to be desired goal, in order to reach which almost any methods should be used. Export premiums and other similar artificial means have long ago ceased to be the method by which attempts were made to swell the export figures. Nowadays efforts in this direction aim at a more indirect support to such steps taken with the object of procuring new markets. For some years the State has annually granted a sum

of Kronor 20,000 to be used as export stipends by persons who desire to work for the distribution of Swedish export articles, especially in far distant countries. Certain legations and consulates have attached to their staff so-called commercial attachés who are engaged in similar work. The Swedish General Export Association, founded in 1887, has for several years received financial support from the State,

When leading the country's commercial policy in general, consideration for the interests of its export is always shown. Sweden is one of the countries where the free-trade movement, which originated in England, first broke down the barriers in its way. As early as 1850—60 the old system with all its import prohibitions and prohibitive clauses was completely discarded. The commercial alliance with France of 1865 is a milestone in the same direction, but in Sweden as on the Continent of Europe the days of free trade were numbered. The movement arising from the agriculturists for the creation of a new system of protection suitable for the changes that had recently taken place, was victorious in 1888 after a hard struggle, and since then the Swedish policy regarding Customs may be characterised as moderate protectionism. The customs tariff at present valid dates from the year 1911, and arose in connection with the conclusion of a new commercial and shipping treaty with Germany, the only country with which Sweden has a detailed tariff treaty at the present time. The commercial and shipping agreements contracted with other countries as a rule contain only a promise of "treatment as most favoured nation" and other points of more ordinary contents. In order to avoid certain inconveniences connected with the protection system, regulations have been published for the reclamation of duty under certain conditions, also concerning stocks in bond, free ports and free stocks.

In the foregoing mention has already been made of the great progress Swedish shipping has made, especially in distant waters, during the last few years, and which has been accompanied by similar success to Swedish export in countries on the farther sides of the oceans of the world. There is no doubt that the wonderful capacity for expansion that the manufacturing industries possess together with *the support the State has given for the maintenance of direct and regular shipping-lines* have been of the greatest importance in this connection. There are now lines of cargoe ships supported by subventions from the State plying between Sweden and South America (Argentine and Brazil), East Asia, Russia, Australia, The United States of America, and Mexico. A good deal of work has been laid down in bringing about a direct Swedish passenger line between Gothenburg and ports of The United States of America; a joint stock company has been founded and the plan will certainly be realised in the near future. The line between Trelleborg in South Scania and Sassnitz on the island of Rügen is administrated by the State itself. This steam ferry connection, which is managed jointly by the Swedish and Prussian State railway administrations, has greatly contributed to the development of the mutual commercial connections between Sweden and Germany. The steam ferries used by the line are the largest in Europe.

The State having thus, by means of direct subvention, provided shipping lines that are of such great significance for the export of the country, and in granting credit to shipowners on favourable terms in the form of loans from a fund (the so-called Ship Owners' Loan Fund, amounting at present to 17 million Kronor) has also endeavoured to assist the development of Swedish shipping in general.

The increase in Sweden's trade turnover from 1836 to 1913 inclusive will be seen in table I below.

7 *Sweden, San Francisco 1915.*

Value of Imports and Exports in Kronor 1836—1913.

Annual Average	Goods				Money and Raw Gold and Silver	
	Import	Export	Total	Balance of Export and Import	Import	Export
1836—40	25 967 000	28 849 000	54 816 000	+ 2 882 000	1 249 000	1 038 000
1841—45	27 485 000	30 607 000	58 092 000	+ 3 122 000	1 664 000	2 912 000
1846—50	33 558 000	37 599 000	71 157 000	+ 4 041 000	2 847 000	2 316 000
1851—55	53 271 000	60 488 000	113 759 000	+ 7 217 000	6 873 000	1 250 000
1856—60	79 771 000	73 197 000	152 968 000	— 6 574 000	1 182 000	5 786 000
1861—65	99 985 000	92 133 000	192 118 000	— 7 852 000	841 000	334 000
1866—70	130 295 000	125 278 000	255 573 000	— 5 017 000	2 331 000	1 445 000
1871—75	237 672 905	201 256 033	438 928 938	— 36 416 872	8 699 248	3 269 281
1876—80	259 904 762	208 583 414	468 488 176	— 51 321 348	8 600 899	1 272 436
1881—85	312 108 304	243 362 331	555 470 635	— 68 745 973	5 417 554	337 310
1886—90	331 528 049	272 467 905	603 995 954	— 59 060 144	3 999 277	161 396
1891—95	349 479 144	317 762 043	667 241 187	— 31 717 101	2 154 186	463 842
1896—00	446 145 927	358 551 043	804 696 970	— 87 594 884	6 178 098	30 235
1901—05	527 502 876	410 434 193	937 937 069	—117 068 683	5 888 387	11 994
1906—10	638 501 139	515 357 510	1 153 858 649	—123 143 629	6 239 428	4 310
1911	690 448 757	663 535 974	1 353 984 731	— 26 912 783	6 168 176	39 544
1912	782 893 946	760 469 404	1 543 363 350	— 22 424 542	10 820 021	156 350
1913	846 537 568	817 347 039	1 663 884 607	— 29 190 529	12 024 516	282 520

The great increase in the imports during recent years is partly explained by the rise in consumption, and partly by the requirements of raw-material and machinery for industrial purposes.

A comparison with the commercial statistics of other European countries shows that Sweden, both as regards import and export, in proportion to the population occupies a high position, *almost corresponding to that of Germany*.

The chief import articles are the following: grain and products thereof—before 1880 the production of corn showed, on the other hand, a balance in export—; colonial goods, chiefly coffee and tobacco (while the production of sugar is sufficient for the country's needs); garden productions; wines and spirits; raw-materials for the textile industry, woven goods and various kinds of manufactured goods; hides and skins; mineral oils, and rubber; oil-cake; coal and manures. Coal heads the list of imports.

Timber occupies by far the most important position among *export* articles, and during certain years has reached a value higher than all other exports put together. The most prominent of these are: wood-pulp and paper; live stock, pork, butter and cream; machinery and especially separators, motors, harvesting machinery, and telephone apparatuses; matches; street-cobbles; iron and metalgoods; iron-ore.

The countries with which Sweden is chiefly engaged in trade are, Germany, Great Britain, Denmark, Norway, Russia and Finland; and in a lower degree, France, the Netherlands, Belgium, and the United States of America. Germany occupies the most important place as regards Sweden's import, while Great Britain is her largest customer.

The extent of Sweden's commercial turnover with Germany, Great Britain and the United States of America is set forth in the following table:

Annually	1 000 Kronor		Per cent of the whole		
	Import	Export	Import	Export	
			GERMANY		
1871—75	55 565	14 333	22.55	7.01	15.50
1876—80	59 075	14 411	22.00	6.87	15.36
1881—85	88 239	18 958	27.79	7.78	19.10
1886—90	101 803	29 026	30.34	10.65	21.51
1891—95	116 913	42 498	33.25	13.36	23.80
1896—00	156 538	51 872	34.61	14.47	25.70
1901—05	203 559	70 246	38.16	17.12	29.01
1906—10	226 098	106 070	35.07	20.58	28.63
1911	244 188	133 518	35.05	20.12	27.77
1912	275 420	171 000	35.09	22.48	28.88
			GREAT BRITAIN		
1871—75	81 362	108 228	33.03	52.91	42.05
1876—80	77 223	109 084	28.76	51.98	38.95
1881—85	82 333	119 468	25.93	49.02	35.96
1886—90	92 875	126 029	27.68	46.23	36.00
1891—95	95 152	140 485	27.06	44.15	35.18
1896—00	138 072	153 828	30.53	42.90	36.00
1901—05	138 887	154 169	26.04	37.56	31.05
1906—10	164 147	173 783	25.45	33.72	29.13
1911	160 830	195 829	23.09	29.51	26.22
1912	189 030	222 790	24.08	29.29	26.65
			UNITED STATES		
1871—75	5 522	5 095	2.24	2.49	2.35
1876—80	7 613	1 195	2.84	0.57	1.82
1881—85	7 894	973	2.49	0.40	1.58
1886—90	6 711	1 791	2.00	0.66	1.40
1891—95	11 754	722	3.34	0.24	1.87
1896—00	9 312	196	2.06	0.06	1.17
1901—05	16 955	1 976	3.18	0.48	2.00
1906—10	56 454	14 744	8.76	2.86	6.14
1911	54 656	24 280	7.84	3.66	5.80
1912	60 460	32 150	7.70	4.23	5.99

The size of the Swedish commercial fleet from 1850-1912 inclusive is shown in the table below. (Before 1900 all ships from and including ships of 20 tons upwards.)

At Close of Year	Number of Ships	Total Tonnage	Sailing Vessels	Steam Ships			Average Tonnage
			Tons	Tons	Ditto multiplied by 3	H. P.	
1850	2 744	205 800	201 800	4 000	12 000	—	213 800
1860	3 200	283 600	271 600	12 000	36 000	6 000	307 600
1870	3 376	350 200	319 300	30 900	92 700	11 601	412 000
1880	4 333	552 400	461 600	90 800	272 400	24 601	734 000
1890	3 874	510 947	369 680	141 267	423 801	37 843	793 481
1900	2 987	613 792	288 687	325 105	975 315	67 317	1 264 002
1910	2 849	769 985	176 912	593 073	1 779 219	466 410	1 956 131
1911	2 758	765 068	154 968	610 100	1 830 300	481 805	1 985 268
1912	2 793	805 386	153 827	651 559	1 954 667	514 144	2 108 504

Thus it will be seen that in Sweden, just as in other countries, the number of ships has decreased rather than increased during recent years, while the tonnage, as far as steam ships are concerned, has increased. For a long time Sweden possessed steam ships of but small capacity, but recently and on account of the birth of regular lines trading with distant countries, a considerable number of large and modern cargoe steamers have been added to the fleet.

The total extent of shipping with abroad is given in the following table.

Annually	Ships Arriving		Ships Departing		Total	
	Number	Tons	Number	Tons	Number	Tons
1876—80	21 919	3 196 448	21 472	3 231 885	43 391	6 428 333
1881—85	27 611	4 226 782	21 182	4 204 253	53 793	8 431 035
1886—90	28 640	4 934 938	27 012	4 933 878	55 652	9 868 816
1891—95	30 241	5 931 836	29 485	5 970 121	59 726	11 901 957
1896—00	34 140	7 781 894	34 179	7 793 822	68 319	15 575 716
1901—05	35 958	8 896 728	36 036	8 888 616	71 994	17 785 344
1906—10	35 164	10 132 689	35 246	10 141 969	70 410	20 274 658
1911	36 241	11 634 258	36 318	11 756 389	72 559	23 390 647
1912	38 057	12 681 250	38 584	12 830 640	76 641	25 511 890

In proportion with the country's population the foreign shipping with Swedish harbours is unusually great, being on an average for the years 1906—10 nearly 400 tons per head. Of all European countries only Denmark, the Netherlands, and Norway are able to point to higher figures. A similar calculation for Great Britain shows only a little more than 300 tons, and when it is remembered that Swedish home shipping is more extensive than that of any of the countries mentioned, we find that shipping in Swedish ports is greater than in any other European country. Of the entire trade with Swedish ports about 50% is at the present day carried by Swedish ships. The corresponding figure at the close of the nineties was only 37%.

It has already been pointed out in the fore-going that during recent years the importance of water-courses has been more clearly realised in Sweden. The majority of Swedish canals, it is true, were cut years ago. The Hjälmare Canal, for instance, which unites Lake Mälar and Lake Hjälmar, was commenced as far back as the fifteenth century. The Trollhätte Canal running past the water-falls in the River Göta and forming a navigable connection between Lake Vänern, the largest lake in Sweden, and the North Sea, was opened for traffic in the year 1800. Soon after work on the Göta Canal, the longest in Sweden, was commenced. This canal, which unites Lake Vänern and Lake Vättern with the Baltic Sea, was completed in 1832. Towards the close of the eighteenth century canal-building was almost entirely given up, but during the present century public interest in the canal question has re-awakened, as shown by the commencement of the reconstruction of the Trollhätte Canal, which is to be made much deeper and for that purpose has been taken over by the State. The Södertälje Canal connecting Lake Mälar and a bay in the Baltic will in all probability be much extended in the near future.

Owing to the wealth of bays and indentations on the costs and the absence of tide Sweden possesses a great number of excellent natural harbours and quays, on the improve-

ment of which large sums of money have been offered. The two most important ports are Stockholm and Gothenburg, the two largest towns in the country. The port of Stockholm is chiefly of importance for the trade with Finland and Russia and the coast traffic North and South along the Baltic, whereas Gothenburg is the port from which the trans-oceanic lines of steamers depart, carrying their merchandise all over the world. The two towns, in the southerly province of Scania, Malmö, where a large and modern dry dock has recently been built, the largest in Sweden, and Helsingborg are of great importance to Swedish shipping.

TELEPHONE CENTRAL OF THE STOCKHOLM
TELEPHONE Co LTD, AT STOCKHOLM

THE TELEGRAPH AND TELEPHONE SYSTEMS.

1. Telegraph.

The public telegraphic communication is principally maintained by the State, in the first place through the telegraph offices, and also, though on a smaller scale, by means of the Swedish State railways' telegraph system.

There are no private telegraph companies; yet most of the private railway companies have the right, under the same conditions as those in force for the State telegraphs and railways, to forward private telegrams, both exclusively on their own wires and also in co-operation between their own lines and those belonging to the State.

The Swedish telegraph system was organized as a separate department in 1856. The State telegraph network had already begun to be laid in 1853 and had in 1854 been linked up to other countries by means of a submarine cable to Denmark. The further development resulted in a remarkably speedy increase in the length of the lines until 1877, after when the increase became more gradual, a circumstance which may be attributed, for at least the two last decades, to the ever continuing extension of the interurban telephone system. The following table will roughly show the development of the system since 1860.

Year	Telegraph wires	Paid Telegrams				Fees
	Km.	Home	Foreign	Transit	Total	Kronor
1860	6 778 (4 212 m.)	105 963	38 059	15 146	159 168	475 513 ($126 803)
1870	14 515 (9 021 m.)	365 975	177 275	47 050	590 300	749 748 ($199 933)
1880	20 336 (12 638 m.)	550 841	345 318	90 261	986 420	1 204 878 ($321 301)
1890	22 884 (14 222 m.)	961 476	603 517	190 352	1 755 345	1 412 018 ($376 538)
1900	27 992 (17 397 m.)	1 252 848	889 216	364 255	2 506 319	1 800 913 ($480 243)
1910	32 220 (20 024 m.)	1 658 957	1 368 401	872 841	3 900 199	2 265 193 ($604 051)
1913	34 030 (21 149 m.)	2 053 647	1 590 594	1 155 038	4 799 279	2 678 673 ($714 313)

The Swedish telegraph system is now, by means of many lines, in connection with all neighbouring countries; thus, by land with Norway and Russia, and by sub-marine cables with England, Denmark, Germany, and Russia. One half of the cables to Denmark and Germany are owned by the Swedish telegraphs; the other half belongs to the respective foreign countries and the cables to England and Russia are owned by a

private company. A comparison between the extent of the telegraph and railway systems and their respective importance for the telegram service will give the following figures for 1913:

	Length of Lines in km.	Number of Offices	Paid telegrams despatched
Telegraph system	34 030	1 206	2 756 195
State railways	16 704	514	92 289
Private railways	12 783	1 266	114 879
Total	63 517	2 986	2 963 363

The total length of the Swedish telegraph lines amounted thus in 1913 to 63,517 km. (39,476 Eng. miles) and the number of stations to 2,986. The number of home and foreign paid telegrams was 2,963,363; 857,168 came from abroad, and the transition telegrams amounted to 1,155,038; if to these figures are added 260,418 service telegrams and circulars the total number of telegrams despatched amounts to 5,141,302; in these figures are not included the telegrams and communications in connection with the management of the railways.

The Morse system is principally used, but in contrast to the Telegraph Companies in America the Swedish telegraphs on all such lines are operated on the open circuit plan. The closed circuit system is employed on some of the railways only. On more important lines the telegraphs are worked on printing apparatuses according to the Wheatstone-Creed system; on others by means of the Morse duplex and quadruplex.

The charges for the expedition of telegrams in Sweden are probably among the lowest in the world; the rate, which is the same for the whole kingdom, is fixed at 5 öre (1.3 cents) per word, with a minimum of 25 öre (6.7 cents) per telegram. A telegram containing five words, sent from the most southernly station to the most northern, covering a distance as the crow flies of 1,500 km. (930 miles, corresponding almost to the distance between San Francisco and Denver, and traversing a wire length of over 2,300 km. (1,400 miles) costs only 25 öre (6.7 cents). It is, however, to be observed that both address and signature, as is the case in international telegraphing, have to be paid.

A great advantage enjoyed by the public is that telegrams may be sent over the telephone to the telegraph station without extra charge for telephoning, and that telegrams received can likewise be telephoned cost free to the addressees who are telephone subscribers and so desire. In 1913 no fewer than 1,969,924 telegrams were sent over the telephone.

In view of the low charge for telegrams, it is natural that the economic result does not show a great profit, considered from a strictly business point of view. The profit lies in the low rates and the public derives the benefit. The undertaking must not, however, be considered as unprofitable, which the following figures for the last three years will prove.

Year	Average capital*	Income	Traffic Costs	Surplus	
				Kronor	Percentage on the average capital
	Kr.	Kr.	Kr.		
1911	4 459 778 ($1 189 274)	2 330 507 ($621 468)	2 191 868 ($584 498)	138 639 ($ 36 970)	3.11
1912	4 414 795 ($1 177 278)	2 692 651 ($718 040)	2 257 591 ($602 024)	435 060 ($116 016)	9.88
1913	4 642 582 ($1 238 021)	2 771 676 ($739 113)	2 545 631 ($678 835)	226 045 ($ 60 278)	4.87

* Plant investment, stores, sundry debtors, cash in hand.

As regards the period previous to 1911 when separate accounts were not kept for telegraphs and telephones, an investigation has shown that since the advent of the telegraph administration, its operations in both these branches have resulted in an average return of $4^3/_4\%$ on the capital. In arriving at this figure compound interest has been calculated on borrowed capital or capital otherwise obtained and not paid back.

The telegraph system possesses its own workshops for the manufacture and repair of telegraph and telephone accessories; at these workshops on an average 437 workmen were employed during 1913 and the product of the year's work amounted to a value of 2,219,462 kronor (591,936 dollars).

As regards wireless telegraphy there were 5 coast stations in Sweden at the end of 1913, of which one belonged to the telegraph system, one to the State railways, and the rest to the naval authorities. Three of the stations were open for the transmission of public messages. The number of paid telegrams sent through these three stations amounted to 3,193. The number of ship stations was 49 and there were 3,351 paid telegrams despatched and received in 1913.

According to the regulations now in force construction or use of wireless telegraphs and telephones is not permitted neither on land or on stationary vessels except by special permission of the Government and observing the conditions which are generally attached to this concession, besides which installations on ships are submitted by special rules to certain restrictions.

2. Telephones.

The first network of telephones in Sweden was laid down in Stockholm in the year 1880 by a private company. About the same time, or shortly after, other telephone networks were laid down in a number of the larger and some of the small towns, and in 1881 the telegraphs also began their own network. In 1888 the operations had advanced so far that there was already a perspective of the establishment of a system extending throughout the country. At the same time as the telegraph authorities laid down new networks they also bought those belonging to private companies, and these efforts to put the telephone system under control of the State have now advanced so far that only *one* private network of great importance now remains in existence, namely, A. B. Stockholmstelefon (The Stockholm Telephone Co.) which operates in Stockholm and district. There are, however, in the same district important local systems belonging to the telegraph administration.

The extent of the State telephone network in 1913 will be seen by reference to the following figures:

Number of exchanges		2 159	
" " telephones		159 252	
(" " " September 1914	over	167 000)	
Total length of subscribers' lines	km.	176 873	(miles 109 927)
of which single wire only	"	1 704	(" 1 059)
Total length of lines between the exchanges	"	150 658	(" 93 634)
of which single wire only	"	388	(" 241).

The telephone switchboard system of the Telegraph Administration is of purely Swedish origin. The exchange apparatus was at first manufactured by the world-renowned Swedish firm L. M. Ericsson & Co. (with a branch at Buffalo, N. Y.) but later on the necessary telephone and telegraph apparatus have been made at the department's own works.

At some small and middle-sized stations a magnetic system with double cord operation is still in use improved at several stations through the introduction of the same lamp signalling arrangements, which distinguish the installations with central battery and thereby approaching the latter system in effectiveness. A central battery system is used at the comparatively large exchanges forming a modification of that used by the above-mentioned firm and has now reached a high state of perfection: the average time taken in replying (the time between the subscriber's call and the reply from the telephone operator) is about $2^1/_2$ seconds calculated on the basis of 230 conversations per hour per operator for the whole day. At the two largest exchanges in Stockholm (27,000 subscribers) and Gothenburg (15,400 subscribers) a special system has been adopted; it is the invention of one of the staff. This system has also come into use in Hamburg where it has been applied at an exchange installation intended for 80,000 subscribers.

A semi-automatic equipment (Western Electric) has been tried experimentally at one exchange with a thousand subscribers; the full automatic system invented by Betulander, an Engineer on the staff, are in use at a number of smaller stations.

Subscribers' lines are metallic and in cities are generally laid down in earth cables, drawn through cement multiple duct conduits, a method invented by A. Hultman, the telephone manager at Stockholm, and afterwards largely adopted in several other countries.

Of the trunk or long distance lines a total of 29,968 km. (18,625 miles) were loaded, i. e. with their electrical qualities artificially altered for the purpose of increasing their transmission efficiency. For the same purpose the wires, when there are many attached to the same poles, are arranged according to a system worked out scientifically which prevents or counteracts various kinds of disturbances.

It may be further stated that in the above given number of kilometers of wires are not comprised the so-called "phantom lines" or superposed circuits, which are obtained by such arrangement of two circuits as permits transmission of three conversations at the same time without mutual interference, and which system has been worked out in Sweden to a high state of perfection; such "phantom circuits" existed in 1913 to a length of 9,846 km. (6,119 miles).

The development of the State telephone since 1896 is roughly shown by the following table:—

Year	Number of Exchanges	Number of telephones	Double wire telephone lines Km.	Single wire telephone lines Km.	Total length of telephone lines Km.	Telephone Conversations		Income Kr.	Average Subscription Fee Kr.
						Included in Subscription[1]	Special charge		
1890	126	4 947	4 656	8 123	12 779	8 156 856	128 737	440 258	87.99
			(2 894 m.[2])	(5 048 m.)	(7 942 m.)			($ 117 402)	
1895	559	22 735	45 079	10 542	55 621	47 000 000	1 555 638	1 936 152	66.38
			(28 017 m.)	(6 551 m.)	(34 568 m.)			($ 516 307)	
1900	1 077	51 998	105 466	6 520	111 986	131 261 200	3 065 700*	3 988 553	54.96
			(65 547 m.)	(4 052 m.)	(69 599 m.)			($1 063 614)	
1905	1 380	81 994	161 928	4 468	166 396	224 177 000	6 842 100*	7 030 807	48.61
			(100 639 m.)	(2 776 m.)	(103 415 m.)			($1 874 881)	
1910	1 932	128 410	260 546	2 905	263 451	318 008 200	14 228 900*	12 016 695	48.56
			(161 930 m.)	(1 805 m.)	(163 735 m.)			($3 204 452)	
1913	2 159	159 252	325 439	2 092	327 531	302 182 400	19 826 353	15 586 330	48.55
			(202 261 m.)	(1 300 m.)	(203 561 m.)			($4 156 354)	

[1] Approximate. [2] m. = eng. miles.

The charge for a full subscription on the State telephone ranges between 50 and 80 kr. (from $13.33 to $21.33) a year; as regards the latter-mentioned amount it becomes reduced to 60 kr. ($16) after 5 years. In all places outside the account district of Stockholm there is an additional charge of 50 kronor once for all which is paid at the commencement of the subscription. In these charges are included, as a rule, apparatus and lines within time limits and an unlimited number of free conversations with subscribers at their own exchange and very often all the other exchanges comprised in their district. The country is, in fact, divided into 151 districts, each with a main exchange and a number of sub-exchanges, and conversations on the trunk lines within the district are, as a rule, (exceptions are given lower down concerning income derived from local networks) free of charge, whereas lines which connect different districts, the so-called interurban lines, are subjected to tolls. Both in Stockholm and at certain sub-exchanges there are cheaper conditions for subscription, the entrance charge being reduced to 10 kr. ($ 2.67) and the subscription fees to 30 kr. ($ 8.00) for telephones with certain restrictions in the right of free conversations. (In Stockholm 150 free conversations are permitted per quarter; for every call in excess of that number the charge is 5 öre (1.3 cents) per conversation.)

The tolls for conversations over interurban circuits are calculated upon the length of the lines and the charge for every period of three minutes or part thereof will be as follows:

Under	100	km.	distance	(up	to	62.1	miles)	15	öre	(4.0 cents)
100—	250	"	"	("	"	155.3	")	30	"	(8.0 ")
250—	600	"	"	("	"	372.9	")	50	"	(13.3 ")
600—	800	"	"	("	"	497.2	")	75	"	(20.0 ")
800—	1 000	"	"	("	"	621.5	")	100	"	(26.7 ")
1 000—	1 200	"	"	("	"	745.8	")	125	"	(33.3 ")
1 200—	1 400	"	"	("	"	870.1	")	150	"	(40.0 ")
1 400—	1 600	"	"	("	"	994.4	")	175	"	(46.7 ")
over	1 600	"	"	(over		994.4	")	200	"	(53.3 ")

A conversation of three minutes over a distance such as between San Francisco and Los Angeles according to this rate costs 50 öre (13.3 cents); a conversation from San Francisco to Seattle costs kr. 1.25 (33.3 cents).

For urgent conversations it is possible to obtain preference over others by payment of double the ordinary charges. For conversations between 9 p. m. and 7 a. m. the charges are reduced to $^1/_2$ or $^3/_5$ of those stated in the above table. There are special advantages for press conversations which are used in Sweden to a great extent instead of press telegrams.

There are at present "interurban" connections between all the places of any importance in the kingdom, and conversations can take place between any of the connected stations, even at a distance of more than 2,000 km. (1,250 miles). On the longest distances the Egnér-Holmström strong current telephone, invented by two members of the telegraph staff, is often employed, by means of which conversations are held on unloaded wires of ordinary dimensions, over about 3,000 km. (1,800 miles) distance, and even farther. Telephone connections with abroad are at present limited to Denmark, Norway, and Germany.

The economic results of the State telephone are more favourable than those of the telegraph. For the three years during which the capital, income and expenses were divided between the telegraph, local networks and interurban network the following figures have been obtained (each local network embraces an account district with its main exchange, sub-exchanges, telephones, subscribers, and trunk lines within the district):

	Year	Average Capital Kr.	Income Kr.	Traffic Costs Kr.	Surplus	
					Kronor	Percentage of the average capital
Local networks	1911	37 922 692 ($10 112 717)	7 675 802 ($2 046 880)	5 775 391 ($1 540 104)	1 900 411 ($506 776)	5.01
	1912	40 298 883 ($10 746 368)	8 328 327 ($2 220 887)	5 901 822 ($1 573 819)	2 426 505 ($647 068)	6.02
	1913	43 844 601 ($11 691 893)	9 064 664 ($2 417 244)	6 487 882 ($1 730 102)	2 576 782 ($687 142)	5.88
Interurban network ...	1911	21 360 356 ($5 696 094)	5 628 278 ($1 500 874)	2 466 291 ($657 678)	3 161 987 ($843 196)	14.83
	1912	22 039 400 ($5 877 173)	6 246 027 ($1 665 607)	2 700 449 ($720 120)	3 545 578 ($945 487)	16.09
	1113	23 491 038 ($6 264 276)	6 521 665 ($1 739 111)	3 187 946 ($850 119)	3 333 719 ($888 992)	14.19

It should be observed that as the telegraph, local and interurban offices are installed in the same premises and the staff is to some extent the same for the different branches—particular reference is made to the common administration—it is of course difficult to arrive at an exact distribution, especially of the expenses in the three branches, for which reason the above-stated table must to a certain extent be regarded as approximate. It is, however, evident that the best result is given by the interurban network, in spite of the afore-mentioned relatively low charges for conversations, which form the only income in the branch. Regarding the income from the local networks, besides subscriptions and entrance charges, conversation charges are also included, which in exceptional cases have to be paid on certain long lines within widely extended account districts, also charges for conversations from sub-exchanges of a new type with cheaper subscription charges and free conversations only between subscribers at the same exchange.

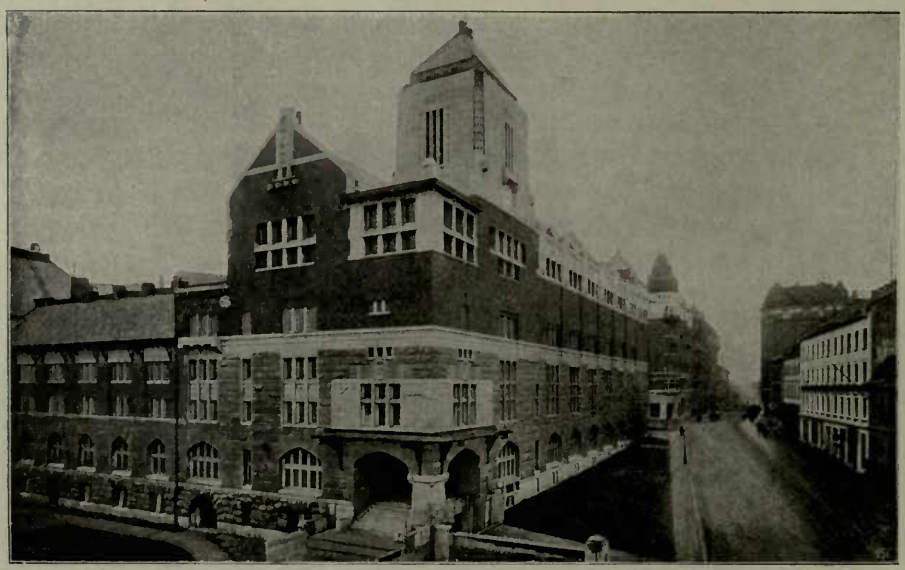
Beside the State telephone network there existed at the end of 1913 telephone wires to a length of 172,866 km. (107,437 miles) belonging to private telephone companies, societies, communities or private railways; and the number of stations in use in their telephone network amounted to 76,121.

The leading telephone company is, as already mentioned, A. B. Stockholmstelefon (Stockholm Telephone Co.) whose sphere of action embraces a circle with Stockholm as a centre and a radius of 70 km (43.5 miles). This company possessed at the close of 1913 165,340 km. (102,759 miles) double lines of which 127,306 km. are within and 38,034 outside Stockholm and 73,577 telephones, of which 59,630 are within Stockholm. The number of exchanges was 182. The number of conversations in 1913 was about 185 millions. The yearly charge for subscription and right of unlimited free conversations within the whole 70 km. district is 80 kronor ($21.33), to which has to be added a single entrance fee of 50 kronor ($13.33); the subscription can, however, be made for a limited number of conversations, for a charge of as low as 20 kronor ($5.33) per year and 10 kronor ($2.67) entrance fee, when the conversations to certain telephones must be paid at the rate of 5 öre (1.3 cents) each.

A summary for the whole of Sweden, including both the State telephone network and the private networks, gives the following figures illustrating the present extent of the use of the telephone: the length of existing lines, principally double wires, formed at the end of 1913 500,397 km. (310,998 miles); the number of central exchanges at the same time amounted

to 2,390, and the number of telephones 235,373. Comparing the number of telephones with the population there will be found about 48 telephones per 1,000 inhabitants; in the city of Stockholm alone there are over 241 per 1,000 inhabitants and in other comparatively large towns between 70 and 80 per thousand. Comparing the number of telephones per 1,000 inhabitants in the whole country with the density of population—12 inhabitants per sq. km. (32 per square mile)—it will be admitted that as regards the numerical development of the telephone Sweden occupies the first place in Europe, at least among countries with double-wire networks. The number of conversations registered in 1913 was over 507 millions, or about 90 per inhabitant; in comparison it may be pointed out that the number of postal despatches (letters, postcards, and book post) during the same period was 239 millions or about 42 per inhabitant.

LAYING CABLE CONDUCTS IN THE STREETS OF STOCKHOLM



ROYAL TELEGRAPH BUILDING, GOTHENBURG

RAILWAYS.

The construction of railways in Sweden was commenced at the beginning of the 1850 decade. The first line laid down was a private enterprise built by a company under Government charter and opened for traffic in 1856.

At about the same period as the charter was granted the parliament decided that all the principal railways should be built under state control, and only a few months after the construction of the just-mentioned line, the first section of the projected State railway between Stockholm and Gothenburg, and also between Stockholm and Malmö was opened for traffic.

At the close of 1856 the total length of the Swedish railways was about 41 miles.

At the end of 1913 Sweden possessed 8,935 miles of railway lines, not including some 1,300 miles under construction or concession. Of the railways working 2,913 miles belonged to the State and 6,022 to private companies.

The Swedish railways occupy a leading position as regards the number of inhabitants. Only North America and Australia exceed Sweden in this respect. As regards the area Sweden possesses a net of railways only slightly under the average in Europe.

If the difficulties which had to be contended with, especially during the first decades, in obtaining capital are taken into consideration and, in addition, the difficulties which a constructor has to overcome as regards Swedish ground, the development of the Swedish railway system is wonderful, and the dimensions to which it has attained now in the second decade of the twentieth century prove indisputably that it is the greatest economic benefit enjoyed by the country during the two last centuries.

The Swedish railways, are as a rule, single-tracked but on the chief lines of the State railways double tracks have been in course of construction during the last few years; there are now (1914) about 125 miles completed. The State railways are all of the ordinary gauge (4 feet $8^1/_2$ inches). The private railways are normal gauge as to 3,929 miles and 2,093 narrow gauge.

The weight of rails used by the State railways varies between 82 and 67 lbs. per yard and those used by the private railways between 91 and 10 lbs. per yard.

The stations are, as a rule, applied with modern interlocking plants.

Several large stations have electric interlocking plants. The others are mechanically interlocked.

Electric semi-automatic block-systems are installed on many, both single and double track lines, especially near the large towns.

The State railways have all their distant signals illuminated with "Aga"-flashlight, system Dalén. Some private railways and also a few stations of the State railways also use the "Aga"-flashlight for illuminating the home-signals.

The State railways have had a new signal system on trial during the last two years. This system includes the so-called three-aspect-distant-signal, and home-signal with a special semaphore for through-signalling. The three-aspect-distant-signal indicates different aspects in accordance with the home-signal, showing "stop," "all clear" for sidetrack or "all clear" for maintrack. The semaphore for through-signalling indicates to an approaching train, if it is allowed to pass the station without stopping or not. Semaphore for through-signalling is only applied to the signal for the straightest track, which can be passed at full speed.

The many splendid bridges, principally in the northern part of Sweden, necessitated by the numerous rivers, are particularly characteristic for the Swedish railways and conspicuous as a mark of Swedish engineering skill.

When railways were first introduced wooden bridges were used, but with small spans only. Long spans in this material would have met with considerable difficulties inconstruction.

Arched bridges of stone were soon brought into use when the ground was suitable, but when it was seen that the cost of stone bridges as they were then constructed, exceeded the cost of iron or wood with the same breadth of span (especially in large ones) stone bridges were only rarely used. Iron was therefore adopted instead, which material since then and up to recent years has chiefly been used for the construction of railway bridges.

No one could, however, imagine that the railway traffic would develop so rapidly as it has, continually necessitating stronger and consequently heavier locomotives. The result of this is that the old railway bridges are now too weak and have therefore, to a great extent, either to be replaced or strengthened.

The generally accepted opinion that iron bridges were superior to stone ones gradually began to lose ground and stone bridges more and more regained their former popularity to the front.

The well-known excellent qualities of the stone bridge, viz, comparative indifference to increased traffic loads, slight costs for maintenance, and practically unlimited durability, have during recent years received more and more consideration. It is now a rule at the State railways that in drawing up proposals for new bridges the strictest attention shall be paid to the choice of the material for construction. In this connection, the modern building material known as reinforced concrete has certainly come to occupy a prominent place owing to its suitability and possibilities for future development.

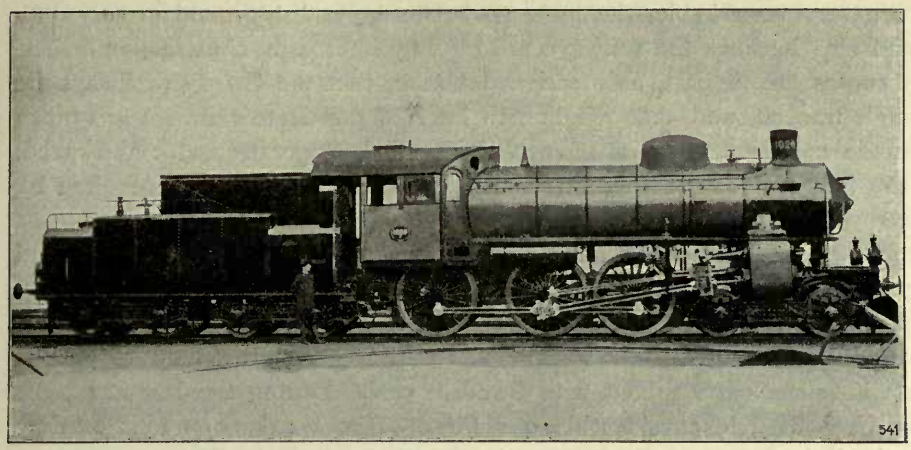
Among other works of skill reference may be made to the two tunnels in Stockholm under the Södermalm district, one of which, belonging to the State railways, is 1,320 feet in length, the other, constructed for a private railway, 1,960 feet.

At the end of 1913 the capital invested in Swedish railways amounted to $311,000,000. The capital of the State railways amounted to $166,400,000. The working expenses of the private railways amounted to $114,700,000 for the normal gauge and about $30,000,000 for the narrow gauge.

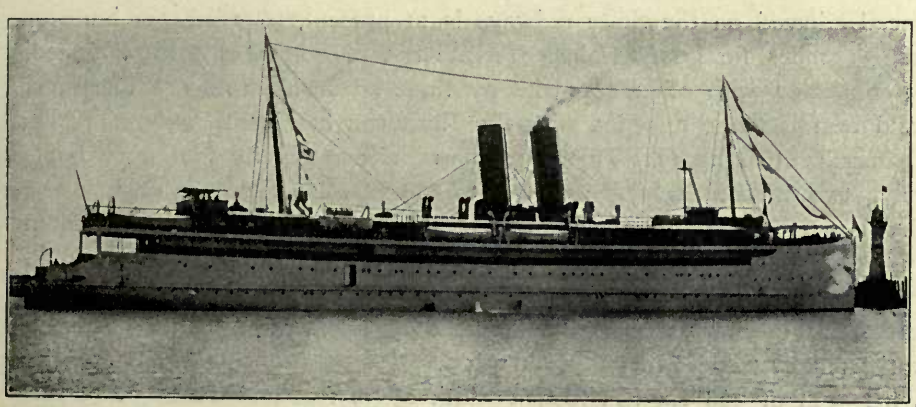
The Swedish railways are built at the lowest cost of all railways in Europe.

The cost of railways per mile is on an average:

England	$264,200
France	$124,000
Germany	$101,000
Sweden	$ 33,000
" State railways	$ 51,000
" ordinary gauge, private railways	$ 30,000
" narrow gauge, private railways	$ 15,000



EXPRESS-LOCOMOTIVE,
GOVERNMENT RAILROAD



RAILROAD FERRY
"QUEEN VICTORIA"

These figures are very remarkable, the more so because Swedish ground is very difficult to work in, and also because the railways are of very thorough construction. The principal contributory causes are in part, as mentioned before, that the Swedish railways are to a great extent single tracked, and that the branch lines of the State railways are much lighter than those on the continent which are generally intended for greater traffic and speed. Another reason for the low cost of construction is that the land is generally given free by the different owners.

The rolling stock, particularly that of the State railways, is of excellent quality and can favourably compare with that of any other country.

The locomotives have for several years been constructed with super-heating apparatus, which is generally that patented by Schmidt. The fuel that has been used up to date is chiefly English coal, in some cases mixed with Swedish coal. During the last few years German coal has also been used in considerable quantities. About 1,000,000 tons of English and German coal are imported yearly for use in Swedish railways. Thorough experiments with peat as fuel have been going on for some time. Apparatuses on two different systems for fireing with pulverized peat are being tried, a method that has, up to the present, shown very good results.

The railway coaches are universally celebrated for their thorough construction, elegance, comfort and smooth running. Dining cars are attached to all the principal trains of the State and private railways, and all night-trains run sleeping cars. All the carriages are heated during the cold season by a convenient system with steam from the engine.

Passenger cars are nowadays fitted with teak, and recently experiments have been made to supply both cars and engines with ball-bearings of Swedish make, the so-called S. K. E. F. K. O. bearings. Incandescent lighting, the Pintsch system or Aga (Swedish) is generally used. In some cases electricity has been adopted for this purpose. There are through cars between Berlin and Stockholm, constructed according to continental regulations, and fitted with bellows to provide a covered connection between the cars.

All the rolling stock is made in Sweden, the locomotives at works at Trollhättan, Motala, Atlas, and Falun, the cars at factories in Falun, Malmö, Kristianstad, Hässelholm, Linköping, Södertälje and Arlöf. Rolling stock repairs are generally done run at the railway workshops, among which should be mentioned the great central workshops at Örebro belonging to the State railways.

The greatest speed allowed on the State railways is, at present, 56 miles per hour for passenger trains and 31 miles for goods trains. Private run at a somewhat lower speed.

Sweden is now connected with other countries by three steamship routes. The most important, quickest and best is the connection with the European continent between Trälleborg (Sweden) and Sassnitz (Germany). This line is run alternately by four ferry boats belonging, respectively, two to the Swedish and two to the Prussian State railways. The vessels which are the largest passenger train ferry boats in the world, with a maximum of 1,800 passengers on each boat, are built from designs of the Swedish engineer, W. Hök.

The Swedish ferry "Konung Gustaf V," which has a gross draught of 3,062 tons, was built at the Lindholmen mechanical works in Gothenburg; it is principally of Swedish steel from Avesta works and is fitted with Swedish wood.

Each boat has a length of 368 English feet, a width of 52 feet and a draught of 16.8 feet. The two triple expansion engines indicate a maximum of 5,000 H. P. and a speed of 17.5 knots or in other words the journey between Trälleborg and Sassnitz (see map) takes a time of $3^1/_4$ hours.

The train deck has two railway lines amidships with a total unobstructed length of 550 English feet. The tracks do not run the full length of the ship therefore the ship makes the landing stage by her stern. The landing stages are adjustable so that the lines can be safely and quickly connected.

Each ferry boat carries 8 passenger coaches of European bogie type.

The vessels have dining-rooms, smoking-rooms, ladies-rooms, bath-rooms, and cabins for 100 passengers, all installed with a comfort and elegance not surpassed by the greatest Atlantic liners. There is electric lighting throughout and the hot air system is used for heating.

The vessels' lines are very beautiful. They are excellent sea-going boats, praised by all travellers for their wonderful stability even in rough seas. The wireless telegraphy is on the Telefunken system and it is also allowed to be used for private use.

There are enormous iron-ore fields in Lapland just North of the Pole Circle, for the opening of which the most northernly railway in the world has been built by the State.

The mining of ore is principally concentrated to two places, viz., Gellivare and Kiruna. The greater quantity of the ore from Kiruna is shipped via Narvik in Norway, while the Gellivare ore is transported via the *Svartö line and the port of Luleå* in the North East corner of Gulf of Bothnia Bay.

In connection with this northern railway station and harbour it is of special interest to note that the water is frozen from about 6 to 7 months of the year. The ore mined during closed navigation is stored near the harbour on large spaces especially for that purpose, and remains there till the following summer. The harbour arrangements are therefore partly intended to run the ore trucks to the stock yards and the ships and there discharge them, and also the loading from the stocks and transport from there to the ships. There are, besides, special arrangements for separating the different qualities of ore.

The iron-ore extracted from the mines at Kiruna, the most productive iron-ore mines in Europe, is transported to the port of Narvik in the far North of Norway in the Lofoten fiord, by the Kiruna—Riksgränsen (on the Frontier) Line, running seventy miles through regions of eternal snow at 68° latitude, that is to say, at almost the same degree as Alaska.

Sweden lacks amongst her great natural resources coal of such quality that it can be used as locomotive fuel without being mixed with English coal. On the other hand the country possesses enormous waterfall resources. Sweden's water power is calculated at 1,300 H. P. per 1,000 inhabitants. As a comparison it may be mentioned that the corresponding figures for England are 23, for Germany 25, for Austria-Hungary 130 and for France 150.

After exhaustive experiments undertaken on the part of the government it was decided in 1910 to electrify the State railway line between Kiruna and the frontier (Riksgränsen), with the object of gradually electrifying the whole State railway system.

The work of electrification of the line in question was completed in the beginning of 1914. The Porjus falls in Stora Lule river supply the power. The machinery hall for the power station in which are installed turbines of 50,000 H. P. and 4,000 volts tension is formed of a space excavated into the rock 164 feet below the surface and out of the reach of daylight. The supply tunnel is 1,969 feet long and the discharge tunnel 3,937 feet, both excavated in the mountain.

The railway transformers, placed in the Switch-house above the machine hall, transform the tension to 80,000 volts which at four transformer stations erected along the line are reduced to 16,000 volts for the contact line. The wires for the high tension current are supported on tripod iron poles about 66 feet high at 656 feet span. The contact wires are constructed according to the system of catenary-suspension, hanging on iron posts

with a span of 170 feet. Especial automatic tension arrangements have been made in order to obtain a constant tension.

The electric locomotives are of two kinds, namely, express-locomotives and ore-train locomotives. The first-mentioned have a length of about 46 feet, driving wheel diameter of 5.17 feet and a traction power af 5.4 tons. The driving motor is rated at 1,000 H. P. The total weight is 82 tons and the greatest speed of the engine is 62 miles an hour.

The locomotive for drawing the iron ore trains is made of two equal parts. Their length over all is 61 feet.

The diameter of the driving wheel is 3.9 feet and the traction power is 15 tons. The power of the two driving motors is 850 H. P. The total weight is 140 tons and the locomotive can attain a maximum speed of 37 miles an hour.

The income of the State railways was in 1913 $23,800,000 and that of the private railways $17,300,000.

The expenses amounted to $17,900,000 for the State railways and $12,000,000 for the private railways.

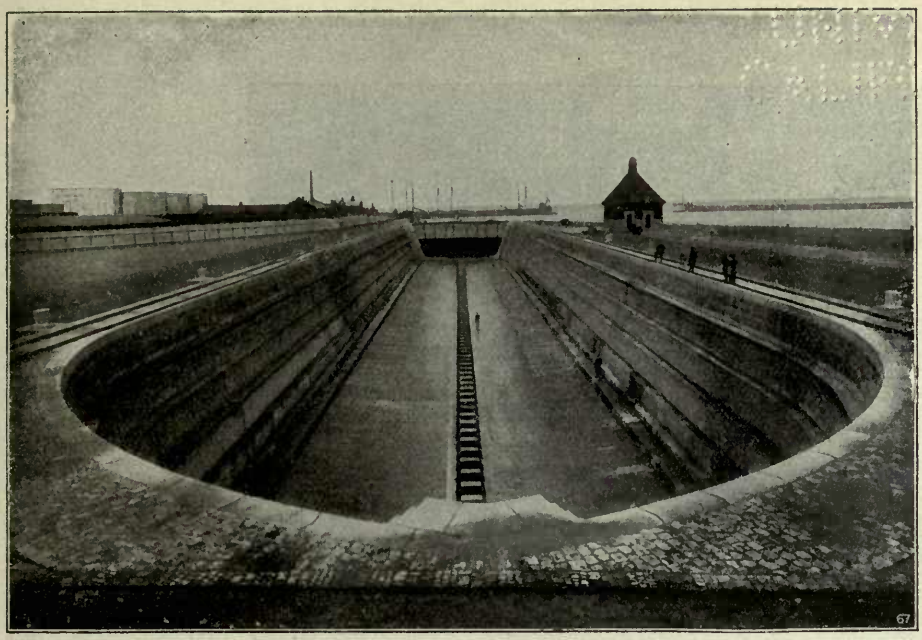
The working expenses for all the railways amounted in 1913 to 67 %. The percentage for the State railways was 65 %, for the normal gauge private railways 66 % and for the narrow gauge lines 69 %.

The total surplus was $11,200,000, $5,900,000 for the State and $5,300,000 for the private railways.

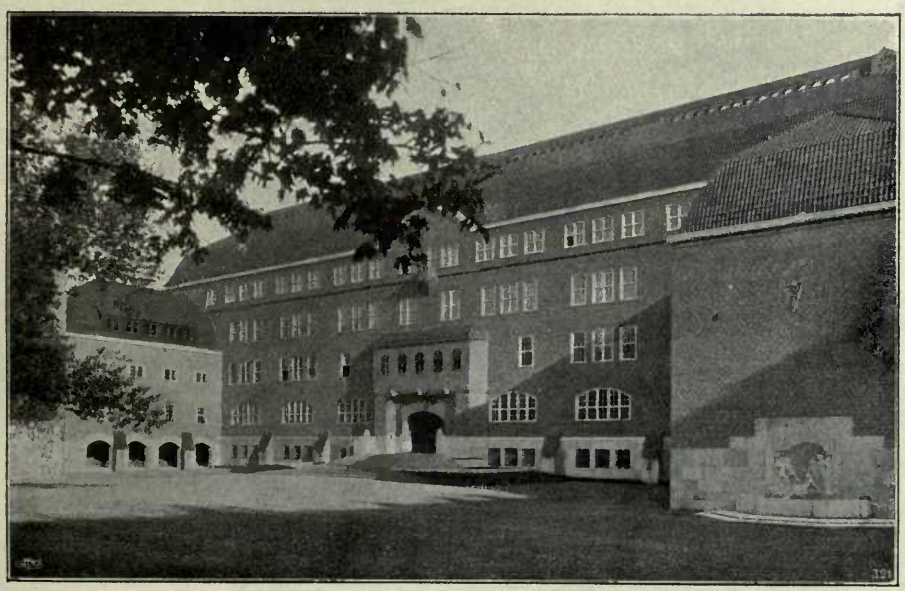
The extent to which the Swedish railways have been able to keep up passenger and goods traffic will be realised by the fact that 62 million passengers were carried in 1913, and that in the same year the goods traffic amounted to 35 million tons.

During the year 1913 50,120 persons were employed by the Swedish railways, and of this number 27,983 belonged to the State railways.

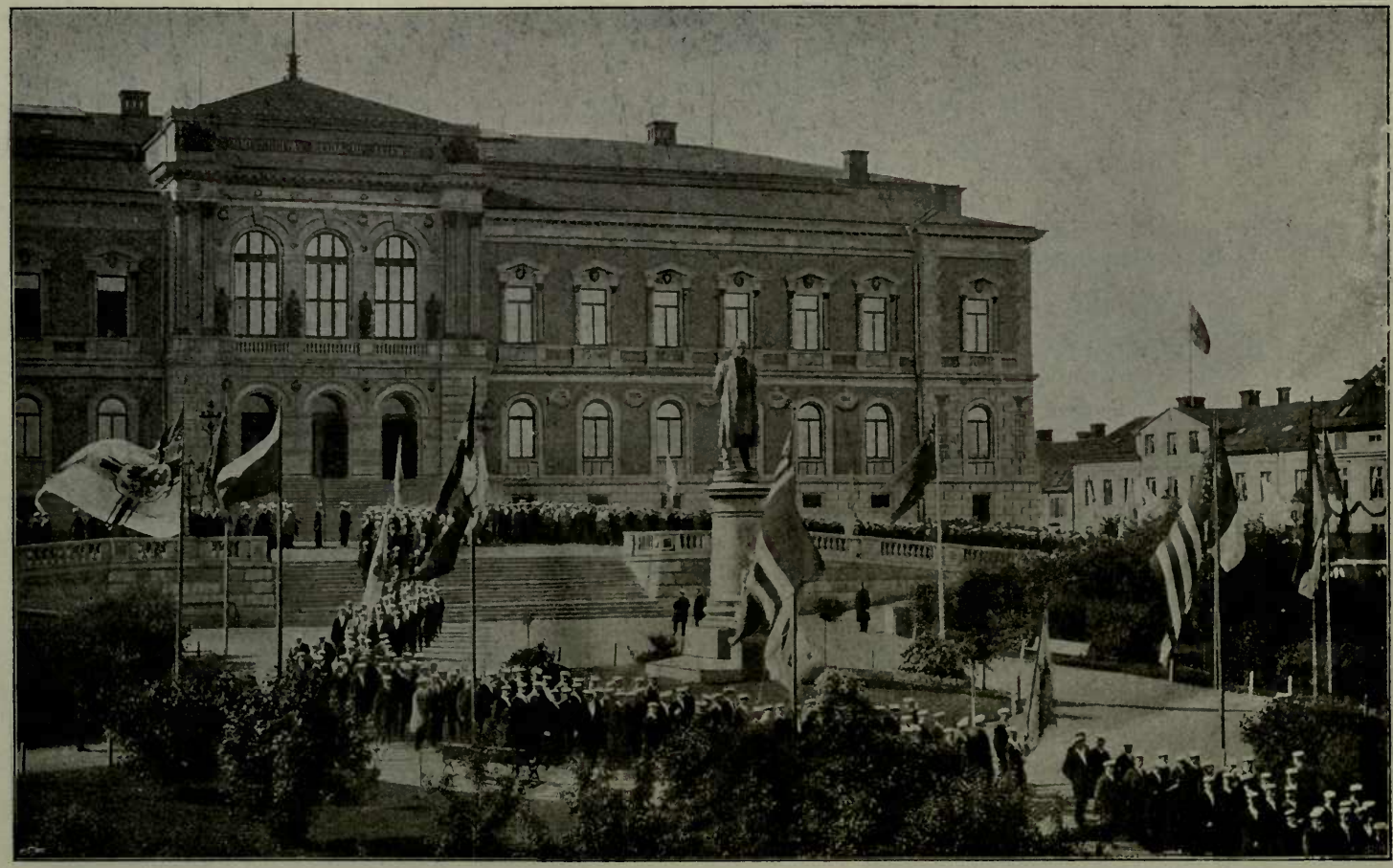
The salaries for the staff amounted to $18,700,000, of which $11,500,000 was absorbed by the State railways.



DRY DOCK AT MALMÖ



SCHOOL-BUILDING
IN STOCKHOLM



UNIVERSITY BUILDING AT UPSALA

EDUCATION.

I. PRIMARY EDUCATION.

1. The Primary Elementary Schools.

Since the year 1842 *school attendance* has been *compulsory* in Sweden. This law is applicable to all children having passed their seventh birthday and between the ages of 7 and 14. For children during the compulsory period there must exist in each parish one *Primary School*. Where rendered necessary one or more Primary Schools must be provided for children between these ages when occasion demands. Children within the compulsory age must be admitted into the parish school in case they do not receive an education at some other public school or private school that provides instruction equal in exactitude and comprehension to that which is to be had at a Primary school at the same stage.

Children who are provided with satisfactory education by their parents at home are freed from compulsory attendance at school.

Should parents fail to do their duty with regard to school attendance their children may be taken from them and placed in the care of other persons, in which case the costs for the maintenance of the child have to be defrayed by the parents.

The Primary School consists of six courses, each one year in duration. These courses are divided into two stages: *The preparatory school* consisting of the two first years' courses, and the *Common School Proper* comprising the last four years.

At such places where the primary schools are well developed, each annual course or class is taught by special teachers, of either sex; at such places where instruction is not so well provided for, several classes must be placed in the hands of a single teacher, and schools do actually exist in which all the classes are instructed by the same teacher.

A year's instruction usually occupies eight months. In the least populated districts, however, the children do not attend school the full eight months. In some sparsely populated places the schools are ambulatory, or in other words the teacher divides his time between the various parts of the parish. In other small places is introduced what is called "every-other-day instruction," that is to say a number of the children attend school certain days in the week and the others attend on the remaining days. The arrangements described above must be regarded as the result of pure necessity, which will gradually be discarded in proportion to the increase in the grants placed at the disposal of National education.

The subjects taught are the following:

In the preparatory school: Divinity, Swedish, Arithmetic, Singing and Gymnastics, besides which drawing and special object lessons are also given in such schools where pre-

vailing conditions allow; in the national school: Divinity, Swedish, Arithmetic, Geometry, Geography, History, Natural Science, Drawing, Singing, Gymnastics Gardening and Tree Planting, besides which instruction in Sloyd can be arranged for both boys and girls.

In small schools the boys and girls are taught together, but in large schools the two sexes are separated.

The teachers' staff in an infant school is chiefly composed of lady teachers, whereas in the other schools devoted to primary education the staff consists of both men and women.

The pupils are admitted free of charge. In 1911 the number of pupils in the Primary schools and preparatory schools amounted to 769,583.

The expenses for Public Elementary Instruction are divided in the following way: The state pays nine tenths of the teachers' commencing salaries and the full amount of the rise in income which the teachers enjoy after a certain number of years of service, while the parish has to pay the remainder of the salaries paid in cash, provide the teacher with free lodging and fuel or corresponding monetary equivalent, and also erect the school building, provide for its maintenance and defray the expenses of furnishing, as also teaching materials.

The expenses of primary education amounted in 1911 to Kr. 43,688,960 or Kr. 7.9 per head. The corresponding figure for 1886 was 2.6 which shows distinctly how greatly the interest in national education has increased.

As an illustration of how successful the work of the national schools has been it may be stated that the whole of the population of Sweden can read and write, with the exception of a very few in the far North.

2. The Primary School Continuation Courses.

With regard to the social conditions at present prevailing in Sweden, as the result of the victory of industrialism, the age for compulsory education closes too early. Children need a guiding hand after they have left the primary school. The government has therefore appointed a committee which has formed a proposal for schools intended to be a continuation of the primary school and in which the instruction given shall be concentrated upon the trade, or branch of trade, which the pupil has taken up or is expected to choose. It is the intention to make these continuation schools compulsory.

The Primary School's continuation courses at present existing are quite voluntary and chiefly aim at giving the instruction already obtained a firmer hold, and at extending it. The most important are the following:

Continuation Courses offering at least 180 hours per annum, arranged so as to suit local conditions; these schools are intended for pupils whose time is chiefly occupied in working for their livelihood.

The Higher Division of the Primary School which possesses a more comprehensive scheme of education that extends to over two, and up to three years.

Higher Primary Schools which comprise from one to four courses of one year with about 30 weeks for each.

Municipal Intermediate Schools which comprise four yearly courses, the final object of which is the "Modern Real" Examination (similar to the Junior Oxford Local Examination) or the same examination as that taken by the pupils of the State "Modern

School" (see below). The municipal intermediate school is the most developed of all continuation schools and, from an administrative point of view is regarded as belonging to secondary education.

3. Abnormal Education.

Schools for the Deaf and Dumb.

Teaching for the deaf and dumb is compulsory. The compulsory age begins as soon as the child has passed its seventh birthday and lasts for 8 years. The country is divided into seven districts to facilitate the organization of deaf and dumb education. Each district maintains its own school which also enjoys a state grant. The deaf and dumb school at Manilla near Stockholm is also provided with a seminary for training teachers.

Schools for the Blind.

The education of the blind is obligatory. They are compelled to attend school on reaching the age of seven and the period of instruction lasts 10 years. There are two preparatory schools, and an institute for the continuation of their education. The educational institutes for the blind are maintained by the state, but are also supported by grants from the county councils.

Schools for Idiots.

The education of the weak-minded is not more thoroughly organized. At present there exist 27 schools for this purpose. Six of them are maintained by private societies, and the others by county councils and towns. There are working-homes in connection with the majority of these schools, intended for imbeciles who have taken the original school-course but are still in need of the institution's care.

II. POPULAR EDUCATIONAL INSTITUTIONS FOR ADULTS.

Symptoms of degeneration are just as little lacking in Sweden as in other civilised European countries. On the other hand, however, it is not difficult to discern in the Sweden of to-day many signs that point to a desire to improve the public health and to lift the people on to a higher moral and intellectual standing. There are many active and beneficial movements in Sweden that tend to improve the manner of living of the people, their morals, and to turn their attention to more idealistic interests. These efforts generally go under the name of *social improvement work*. The great *sporting*, *temperance* and *national defence* movements that have struck at the roots of national life have done much to arouse the nation's vitality and have provided a strong impulse in increasing the wish of the people to avoid the degenerating influences that in many cases dog the footsteps of modern civilisation. This national awakening has naturally enough applied for the assistance of education. The state, for instance, gives financial support for the arrangement of *popular scientific lectures, educational courses in country districts, temperance courses, courses on social subjects* etc., etc. The *public library movement*, that aims at bringing good literature into the homes of the people, is of great importance. With a view to increasing popular education the state has lately begun to give grants for the arranging of *popular concerts*, to which the public is admitted either free of charge or on payment of a very small sum.

The Popular High Schools have proved an important factor in promoting popular instruction. These schools, which are scarcely to be found in other countries besides those of Scandinavia and Finland, chiefly aim at providing youths and young women (age generally 18—20) with an all round education suitable for future citizens, in which strenuous efforts are made to plant in them the practice of self reflection and to increase their moral strength. These schools, which are maintained by private associations assisted by state grants and financial aid from the county councils, have been of excellent service in raising the standard of education among the country people.

There are at present 44 national high schools in existence.

The Summer Courses, which are nowadays held by the universities and high schools of equal rank in turn, form a link in the development of popular education, and may be compared with what are generally termed *university extension courses.*

III. SECONDARY EDUCATION.

The State Secondary Schools of which there are two kinds: The *Modern School* (having a curriculum on practical lines) and the *Higher Secondary School.*

The period for instruction at the modern school is six years and concludes with the *Modern School Examination*, which gives the pupils the right of admission to certain commercial schools and to certain minor appointments. The admission age is 9—10. In order to gain admission to the first class of the modern school pupils must have a knowledge equal to that which is gained by attending the first year's class of the primary school. Some modern schools are arranged on the co-educational system. In others, boys only are admitted. The subjects taught in the modern schools are: Divinity, Swedish, German, English, History, Geography, Mathematics, Biology, Physics, Chemistry, French, and Writing, Drawing, Music, Gymnastics, and Sloyd for boys and Needle-work for girls.

The Higher Secondary School partly consists of a Modern School and partly a College with four years instruction based on the five lower classes of the modern school. The course of instruction in these schools occupies a period of 9 years, and concludes with the Matriculation Examination, which offers admission to the university and high schools and to certain important appointments. The College is divided into two lines, namely, the Latin line and the Modern line. The subjects taught in the College are: Divinity, Swedish, German, English, French, History, Geography, Introductory Philosophy, Mathematics, Biology, Physics, Drawing, Music, and Gymnastics; besides which in the Latin line, Latin and Greek (by choice) are taught. The Modern line has Chemistry on the list. Only boys are admitted to the Higher Secondary Schools.

In 1911 there were 77 public schools, of which 38 were high schools and 39 modern schools. Of the latter 19 were conducted as co-educational schools.

The number of pupils attending the public schools amounted in 1911 to 23,018.

The year's instruction occupies 39 weeks.

The teachers engaged at these schools are chiefly of the male sex. Modern schools arranged as co-educational schools, however, to a certain extent employ lady teachers too. Instruction in Music and Drawing may be given by teachers of both sexes.

The pupils pay a small fee.

The expenses incurred by the public schools, which are State institutions, are chiefly defrayed by the State. It is the duty of municipal authorities to maintain the school building and to provide the head master with a suitable residence or monetary equivalent compensation; besides which, communities that possess modern schools arranged as co-educational schools, are bound to contribute slightly to the teachers' salaries.

In the year 1911 the expenses defrayed by the State for public secondary schools amounted to Kronor 5,877,106.

Secondary Schools for Girls. These schools, as their name implies, aim at providing a high class education for girls. They are private institutions and vary as to organization. In general they are conducted in the same way as *The State Normal School for Girls* in Stockholm which is intended to serve as a model for girls' schools.

The State Normal School for Girls comprises eleven classes. Pupils are admitted at the age of seven. The subjects taught are: Divinity, Swedish, German, French, English, History, Geography, Mathematics, Natural Science, Hygiene, Writing, Drawing, Singing, Needlework, Gymnastics. The final examination of the normal school and the majority of girls' high schools entitles them to the same rights as that of the modern school.

Some secondary schools for girls have arranged a four or three years college based upon the ninth or tenth class, in which the pupils are prepared for the Matriculation Examination. Other secondary schools for girls have arranged a special practical final class in connection with the highest class.

The number of high schools for girls is at present about 80.

The number of pupils at these schools is about 18,000.

The year's instruction generally occupies 36 weeks.

The teachers are chiefly of the female sex.

The pupils pay a special fee.

The schools enjoy State grants. The expenses defrayed by the state in connection with secondary schools for girls at present amount to about Kronor 400,000 per annum.

Municipal Intermediate Schools. As to their object and organization see page 120. These schools are to a certain extent a realisation of the democratic programme: "The Common School as a National School".

The Municipal Intermediate Schools are in general co-educational.

The expenses are defrayed by the municipal councils and the aid of a state grant.

During the school year 1911—1912 there were 15 municipal intermediate schools.

State grants in favour of this kind of school amount at present to about Kronor 200,000 per annum.

Private Colleges for Boys and Co-educational Colleges. As the fees at the state public schools are comparatively small the number of private high schools for boys is not large. At the present time there are ten private schools (both boys and co-educational schools) possessing the right to hold the Matriculation. Three of these have also the right to hold the Modern School Examination.

The principal source of income for these schools is the pupils' fees. The State gives grants towards the maintenance expenses which at present amount in all to about Kronor 170,000 per annum.

IV. ARRANGEMENTS FOR THE PHYSICAL AND PRACTICAL TRAINING OF THE PUPILS.

Contrary to the old school the new system endeavours more and more to make a point of increasing the physical and practical development of the pupils. These efforts will be found to pervade the educational system. Among the special means used by the school for this purpose are *medical supervision*, that becomes more and more thorough as time goes on; *dental care*, the value of which is beginning to be more generally realised; *more gymnastic training*, the encouragement of the pupils to take part in *sport and open-air games*, the encouragement of the *boy-scout movement*, the establishment of *school baths, instruction in swimming, sloyd, domestic economy*, and in *gardening*.

The same object is attained by specially commended instruction on the effects of alcohol and nicotine on the human body.

The new tendency thus adopted bears witness of ever increasing efforts to develop a stronger and more capable race.

V. SOCIAL PEDAGOGICAL ARRANGEMENTS.

Exertions to make the coming generation fitter for the struggle for life may also be discerned in a number of plans of a social pedagogical nature, such as the *feeding of poor children*, the establishment of *workshops* for such children etc., etc. It may also be pointed out that the so-called *holiday colonies* are of special importance. These colonies aim at providing poor and delicate children from the towns with an opportunity to stay in the country during the hot summer months, where they can breathe fresh air and have their physique strengthened by nourishing food.

VI. THE TRAINING OF TEACHERS.

The Lady Teachers for the infant school classes are trained at *Seminaries for infant school Teachers* erected by the County Councils. To gain admission to these seminaries the applicant must have passed through the common school. The period of training varies from eight months to two years.

In order to be admitted as a teacher at a *Common School* and in the *Continuation Courses* of the common school the applicant is required to have passed through a course of training at one of the state *Common School Seminaries*. Admittance to these seminaries is obtained by having passed a special examination held for that purpose by such a seminary, in which the candidate must show evidence of having a good common school education. In certain subjects the candidate must possess a knowledge equal to that required by the Modern School Examination. The period of training at a common School Seminary is four years.

Teachers in scientific subjects at the Secondary Schools must have taken a university degree. There are therefore two examinations: a minor examination intended for teachers chiefly engaged in the Modern School, and a higher one for teachers chiefly occupied

with the college stage. In order to be admitted to the university the Matriculation Examination is required. The minor of the two above examinations for teachers necessitates about four years of study after having passed the matriculation. To be admitted as a legitimate teacher on the staff of a secondary school after having taken a university degree, the candidate is required to spend one year in undergoing a trial course at one of the secondary schools specially appointed for that purpose.

Candidates desirous of obtaining a situation as teacher *at a secondary school in a nonscientific subject* must take the examination of a special school in that subject. For instance in:

Drawing. The examination of the *Technical School in Stockholm* (see page 126). The drawing master's examination at this school requires about five years' training after having passed the Modern School Examination.

Music. The examination of the *Conservatoire* in Stockholm (see page 127). The music master's examination there takes about five years' study after having first obtained the certificate of the Modern School Examination.

Gymnastics. The examination of the *Central Institute for Gymnastics.* This examination takes three years after having acquired the matriculation certificate.

Special courses are arranged for the instruction of *teachers of sloyd,* in *needlework* and *domestic economy*, etc.

The most important of these is *August Abrahamson's Foundation at Nääs* where wood-sloyd is taught by preference and where the *Swedish pedagogical sloyd* method has been worked out and developed.

Those who wish to obtain situations as lady teachers at the *modern schools arranged as co-educational schools* and at the *girls' secondary schools*, must first have passed through the *the Higher Training College for Lady Teachers at Stockholm*, which takes a period of three years after having taken the final certificate at a girls' secondary school.

VII. THE UNIVERSITY.

The Uppsala University possesses four faculties, namely, Theology, Law, Medicine, and Philosophy, the latter faculty being divided into two sections, one for the humanities and one for mathematics and natural science. The number of students at the university in 1911 was 2,295.

The Lund University has the same organization as the above, and in 1911 registered 1,233 students.

The Caroline Institute at Stockholm comprises a medical faculty, and in 1911 had 330 students.

These three educational seats belong to the State.

In the year 1912 the expenses connected with the three State universities amounted to Kronor 2,257,019, of which Kronor 266,057 was furnished by the private estate or funds of the universities.

The following are private Universities:

Stockholm's High School, which possesses a section for mathematics and natural science, and a section for political science and jurisprudence. The number of students in 1911 was 616.

The Gothenburg High School with a humanistic section and which in 1911 had 244 students.

Students must have matriculated in order to obtain admission to these universities.

The instruction is, in general, free of charge.

At the universities and high schools are trained: *Clergymen* (the theological faculty), *Judges* and *high officials for the State administrations* (the faculty of Jurisprudence), *Medical men* (the faculty of medicine) and *Teachers for the public high schools* (the philosophical faculty).

For the training of *Dentists* there is *a Dental Institute*, which is in connection with the afore-mentioned Caroline Institute in Stockholm.

Chemists are trained at the Pharmaceutical Institute in Stockholm.

VIII. TECHNICAL TRAINING.

The Lower Technical Trade Schools are intended for those who are engaged as apprentices or workmen in manufactories and industry who, during their spare time, wish to gain technical or mercantile knowledge. The administration of these schools varies considerably. In general the instruction is given on Sundays and in the evenings of week-days.

The Technical School in Stockholm comprises a technical and Sunday courses corresponding to a lower technical trade school, technical courses for pupils of the female sex, a school for future members of the building profession, a mechanical school and an advanced industrial art school with a special department for the training of drawing masters.

The Technical School at Eskilstuna has Sunday and evening courses, corresponding to a lower technical trade school, and a course in advanced smithwork and metal work.

The Technical Colleges import technical and practical instruction in the elementary branches of technical knowledge. The school course covers three years with 36 weeks' instruction per year. Number of schools 5. Number of pupils in 1911: about 500.

The Chalmer's Technical Institute in Gothenburg comprises both an elementary and an advanced course. The elementary course may be compared with a technical College. The advanced course is similar to a technical high school.

The Technical High School in Stockholm consists of the following different departments: Mechanical Engineering, Electrotechnique, Chemical Technology, Science of Mining and Metallurgy, Civil Engineering, Architecture and Naval Architecture. In order to obtain admission the candidate must first have passed the matriculation examination or be able to prove that he possesses a similar knowledge. The courses take from three to four years.

IX. INSTRUCTION IN FORESTRY.

The Schools of Forestry aim chiefly at the training of forest-keepers.

The High School of Forestry in Stockholm provides instruction for forestry officials.

X. AGRICULTURAL AND VETERINARY TRAINING.

There are in Sweden a number of elementary schools which provide instruction in agriculture called *Farming Schools* and *Agricultural Schools*. Besides these there are two *Agricultural Institutes*, one at Ultuna and one at Alnarp. Candidates desirous of obtaining admission to an agricultural institute must first have passed the modern school examination A proposal has been made to establish an agricultural high school.

XI. INSTITUTES FOR INSTRUCTION IN THE FINE ARTS.

The High School of Art in Stockholm, among other things, gives instruction in the art of Painting, Sculpture, and Architecture. Architecture is also taught at the Technical High School in Stockholm, where there is a special department for this subject, and at the Chalmer's Technical Institute.

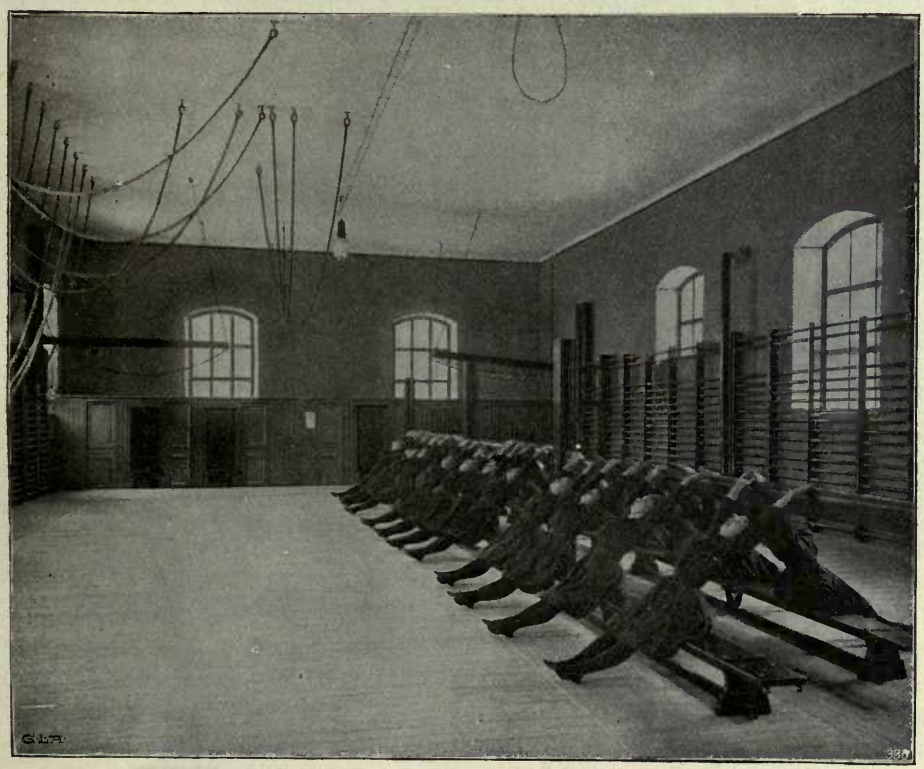
The Stockholm Conservatoire of Music offers instruction in Music and Singing.

In addition to the above-mentioned educational institutes there are *military schools*, *navigation schools*, *mining schools*, *weaving schools*, institutes for instruction in *commerce* and *book-keeping*, *gardening*, *dairy work*, *fishery*, *midwifery*, etc., etc.

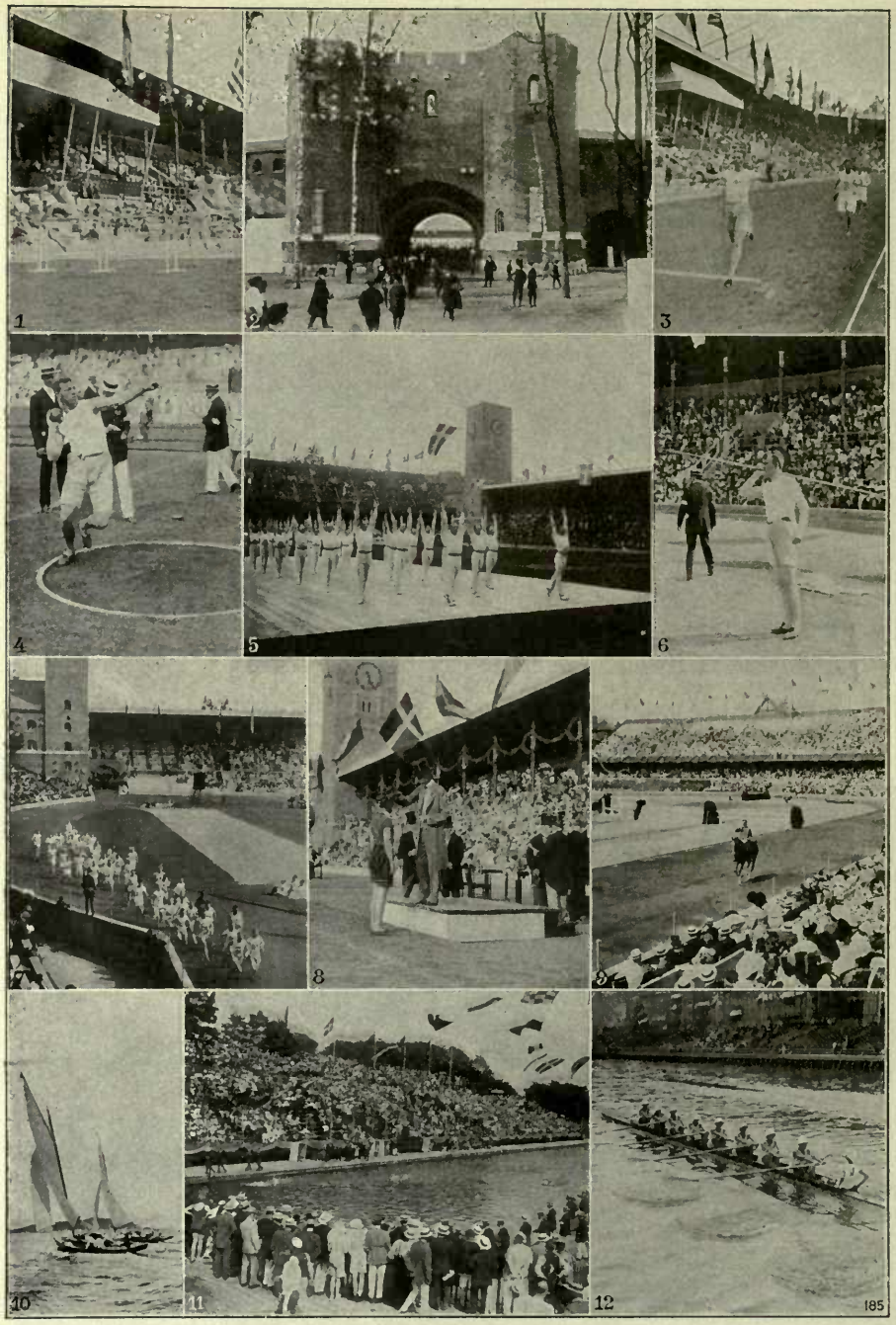
TECHNICAL HIGH SCHOOL
IN STOCKHOLM

A PRIMARY SCHOOL IN STOCKHOLM

SWEDISH GYMNASTS



LADY-GYMNASTS AT THE CENTRAL
INSTITUTE IN STOCKHOLM



SUMMER SPORTS

ATHLETICS AND SPORT.

("IDROTT.")

From time immemorial athletics and sport have occupied a very prominent position in Sweden and in the North in general, evidence of which is to be found not only in ancient documents still in existence but also in the circumstance that the language possesses its own name for them, namely "Idrott." It is therefore misleading to assume that Sweden has only recently appeared as a sporting country, although her interest in athletics and sport has only lately become known in other countries and although sports in general have only recently been adopted in the interests of the development of coming generations. On the contrary we find in the songs of olden times, in the chronicles of the Middle Ages, in illustrations and literature reference made to almost all modern branches of sport from running and ski-running to throwing and jumping.

In those days, of course, such kinds of sport that resulted in the acquirement of food and other useful things were held in the highest esteem, such as hunting and fishing, or such as aided self-protection or the defence of one's native place, such as archery and fencing with the sword and shield.

Other sports, however, enjoyed various degrees of popularity depending upon the temperament and nature of the people in the different parts of the country. We may take, for instance, the characteristic Swedish ball-games of "Pärk" on the island of Gottland which is somewhat similar to cricket, and "slå trill" in the province of Västergötland, etc. It was then the custom for the young people to meet of an evening on the village playing grounds and train themselves in manly sports, and even to this day Pärk competitions are held in Gottland between teams representing the different parishes. We are therefore justified in saying that the Swedes have inherited their sports. It would, indeed, be a matter of surprise if a country like Sweden, whose nature, during all seasons of the year invites her inhabitants to enjoy the exercise of a healthy out-door life, were not a home of sport. Hundreds of lakes tempt her youth to indulge in such sports as are connected with the water, winter and summer alike, illimitable stretches of forest lie covered with deep snow and with long distances between their scattered hamlets compel her inhabitants to feats of endurance when making long and arduous journeys, while the heavy work in forest and field tends to encourage the exercise of healthy recreations on the village-green and sporting field.

In those days, however, sport was not at all adopted in the interests of the education of the young, as it was only regarded as a kind of useful pleasure. Nor was sport used to prevent bad habits, probably because it was considered there were no bad habits that could be cured by it.

The more industry advanced and the population of towns and communities increased and young people suffered from a lack of occupation, the more was the great prophylactic significance of sport realized and understood. The work was taken up by far-sighted men and the task of organizing our sport was commenced. Major General V. G. Balck was and still remains the most prominent of those who first put their shoulders to the wheel and made the re-generation af Swedish sport the object of their lives. It is chiefly due to his never-tiring interest and ever-present energy that there are to-day hundreds of thousands of sportsmen in Sweden united under one great organization, viz. "Svenska Gymnastik- och Idrottsföreningarnas Riksförbund" (The Swedish National Gymnastic and Sporting Association) which has worked very successfully for the further development of sport in this country in co-operation with other associations for certain definite kinds of sport such as, for instance, "Föreningen för skidlöpningens befrämjande i Sverige" (The Swedish Ski-running Association), etc. It must also be mentioned that both H. M. The King and H. R. H. The Crown Prince have supported and still support our sport with the greatest interest and much energetic work that cannot be too highly estimated.

Swedish sport is nowadays organized on modern lines, in which England has, quite naturally, been taken as the model, but countless other branches of sport have, however, kept their national character, especially with regard to winter sports.

By **Winter Sports** we refer to such as of necessity require ice or snow or both. The chief of these are Skating, "the Sport of Sports" and Ski-running. The former is practised throughout the entire country as a pastime and is also used as a means of communication over all the extensive lakes and fiords in which the country abounds. As the result of competition in these ancient sports we are able to record two championships in figure-skating in 1911, besides which several European and World's championships have been won by Sweden.

"Stockholms Allmänna Skridskoklubb" (The Stockholm Skating Club) must be considered as the first skating association in Sweden, which nowadays is in connection with other associations in almost every town all over the country.

Between the years 1860—1880 *Ski-running* had almost fallen into desuetude in the Midlands and southern provinces, probably owing to improved communications which rendered it superfluous as a means of communication. In Norrland, on the other hand, it was and still is almost the only possible means of covering long distances during the winter. In consequence of the general re-awakened interest in sport, ski-running, however, after the above-mentioned date, began to receive its due share of favour and is to-day one of the most popular forms of exercise indulged in by the youth of the country wherever there is snow.

The above-mentioned association for the promotion of ski-running in Sweden annually arranges hundreds of competitions and excursions in various parts of the country. These competitions in ski-running which is for the purpose of traversing snow-covered ground, forests, fields, lakes, mountains, and valleys, are of two separate kinds, viz. Distance or Dispatch running and Hill-ski-ing with jumping. As much as 30 m. have been covered in a single jump. Skate-Sailing is also a much favoured sport. The sail resting on one of the shoulders, the skater sails just as well close-hauled as with a full wind astern. The speed is terrific, and in a good wind and on smooth ice as much as 93 km. per hour have been registered by the log, which of course means that both the muscles and nerves of the skater are put to a very severe test. It is a grand sight on a Sunday when the ice is free

from snow to see our fiords and water-ways simply alive with skaters flashing by on the wings of the wind.

Ice-Yachting is also a very popular winter sport.

"*Sparkstöttning*" is a characteristic Swedish winter sport which consists in the propelling of a light sledge by means of the toe, which is covered with a specially constructed metal cap. Long processions of peasants may be seen everywhere in Norrland, each propelling his sledge, which sometimes carries two persons. In that part of the country this kind of sledge may be called the bicycle of the winter, and they are seen whizzing along the roads covered with frozen snow and across the surface of the fiords. Some good Dame may perhaps glide by you sledging many miles to town to make her purchases, or a farm labourer eagerly spinning over the crispy snow on his way to meet his love, or children sledging to the village school, while sometimes as many as fifty fishermen can be seen in one long line propelling their sledges over the sea, carrying with them their burdens of fish caught through holes in the ice.

Tobogganing is an exceptionally popular sport in Sweden wherever there are hills to be found, and recently bob-sleighing has become a favourite pastime among the visitors at the winter resort of Åre in the province of Jämtland.

There are many clubs for the fostering and development of the various kinds of winter sport, which arrange and conduct competitions. Artificial toboggan courses are found everywhere.

Summer Sports.

Yachting is undoubtedly the most prominent of all kinds of summer recreation. Kungl. Svenska Segelsällskapet (The Royal Swedish Yacht Club), both as regards its number of members and the quantity of boats registered, is the largest club of its kind in the world, and is the principal one of the great number of such clubs that Sweden possesses. In proportion to the population and other circumstances Sweden has experienced an enormous development as regards yachting. Swedish boats have carried home many prizes won in foreign waters and Swedish yacht constructors have time after time proved victorious against foreign competitors. The Royal Swedish Yacht Club's annual regatta is probably the most successful and fashionable sporting event of the summer.

Few countries offer such excellent opportunities for *Rowing* and *Canoeing* as Sweden. Englishmen speak of our country as the "Canoeist's Paradise," and thousands of lakes, streams, rivers, and canals justify their opinion. It is possible to paddle one's canoe right through the country from Gothenburg to Stockholm. These two branches of sport are adopted with the greatest interest and regattas, both national and international, are held annually in which especially Scandinavian oarsmen meet in friendly rivalry.

Swimming is a sport in which Sweden is justified in claiming a very high rank, especially in diving, and it is worthy of mention that the "Swan Dive," for which the Swedes are famous, has received due attention and praise in foreign competitions. Nearly all Swedes of both sexes are able to swim, and it is nothing unusual that when young Swedes are called to join the colours as conscripts one finds that a full company of recruits is quite at home in the water. Those unable to swim are compelled to learn. In the public schools, wherever it is possible, the pupils are taught to swim. In many instances there are swimming baths where instruction is given and where competitions take place during the winter.

General Athletic Sports such as walking, running, jumping, throwing the javelin, etc. have given rise to the establishment of many clubs and associations throughout the country, which arrange and conduct sporting festivals and competitions every year. Swedish sportsmen have successfully taken part in international meetings both at home and abroad. At our sporting festivals the programmes often contain special Swedish sports such as the Gottland games of "Kasta Varpa" and "Stöta Stång," the latter of which is identical with the Scottish game of "Tossing the Caber."

Old Swedish ball-games, such as Pärk in Gottland, are being revived. Lawn Tennis and Cricket are much in favour but Football is the most popular of all.

Bicycling is practised to a very great extent, and Swedish machines can be compared with any foreign make.

Hunting is under the protection of Kungl. Jaktklubben (The Royal Hunting Club) and Svenska Jägareförbundet (The Swedish Hunting Association). The Royal Hunting Club arranges annual Elk hunts at Hunneberg in the province of Västergötland, perhaps the principal big-game hunts in Europe, in which very often as many as 50 of these "Kings of the Forest" fall to the guns. The Swedish Hunting Association, whose head-quarters are at Stockholm and which has branches in the provinces, works chiefly for the preservation of game.

Rifle Shooting occupies a position of rank in Sweden. There are innumerable rifle clubs both large and small which are at work all over the country, chiefly with the object of improving target shooting, and to-day these associations have nearly 170,000 members on their books. This work is supported economically by the State. Shooting competitions for school-boys are also held.

Riding on Horseback, as a sport, has up to the present chiefly been practised by cavalry officers but it begins to be more and more popular among civilians and ladies. There are Race Courses in several parts of the country, the chief of which are the one at Jägersro at Malmö and the Lindarängen course at Stockholm.

Riding clubs have been founded in several places which are able to boast of an ever-increasing number of members. The Olympic Games at Stockholm in 1912 proved that the Swedish Cavalry possesses expert riders, as all the prizes in riding, and the first prize in military, riding both in the individual and team competitions were taken by Sweden. The military riding-school at Strömsholm is considered to be one of the best in Europe.

Trotting Clubs are also in existence and competitions are held annually in various parts of the country.

The Royal Automobile Club is responsible for the welfare of motor sport. Every year, in the winter, large competitions take place, providing very severe tests both for the cars and drivers. Foreign representatives also take part in these competitions.

Aviation is also represented, although at the present time it may be said to be in its infancy as far as Sweden is concerned.

The fact that Stockholm was elected to be the scene of the Olympic Games in 1912 is sufficient in itself to show how great the development has been. The foreign press at the time was unanimous in the opinion that the Swedes carried out the task confided to them in a very successful manner.

The most important sporting event in Sweden is the *Northern Games* which take place every fourth year. They were held for the first time in 1901 on Swedish initiative; they comprise northern winter sports only, and are held in the second week of February. The programme contains Skating, Ski-running, Driving on skis, Horse Races over snow-covered

ground, Long Distance Riding, Skate-Sailing, Ice-Yachting, Hockey, Curling, Hill-sledging, and Sledging parties when the occupants carry torches, excursions by ice brakers and Fishing through holes made in the ice. The programme also contains various kinds of amusements, such as gala performances at the Opera, National Dances and Choir-Singing, etc. These competitions, besides being attended by sportsmen from the Scandinavian countries, have also attracted lovers of out-door life—in Austria, Great Britain, Finland, Germany, and Holland.

With the object of developing the interest of the public in sports an *Athletic Badge* has been instituted, which is open to every Swedish sportsman under the following conditions:—

The competitor must within one calender year have successfully undergone tests in each of the following groups in the presence of a representative of the State union.

Group I. Swimming, 200 meters, or Gymnastics.
" II. The High Jump, at least 135 cm., or the Long Jump, 475 cm.
" III. Running, 100 m., within 13 sec., or 400 m., within 65 sec., or 1,500 m. within 5 min., 15 sec.
" IV. Fencing or Throwing the Disc, at least 40 m., or Throwing the Javelin, at least 50 m., or Throwing the Weight, at least 16 m.
" V. Running, 10,000 m., within 50 min., or Swimming, 1,000 m., within 28 min., or Skating, 1,000 m., within 25 min., or Ski-running, 200,000 m. open country, within 2 hrs. 15 min., or Cycling, 20,000 m. within 50 min., or the candidate shall have taken part in the competition in Football for the Swedish Championship.

The Sporting Badge has three classes: bronze, silver and gold. The above tests are for the bronze badge. In order to obtain the silver badge the candidate shall undergo the same test during each of four consecutive years and is allowed to take the various tests in the order he desires. The gold badge shall be taken in a similar way during each of eight consecutive years. A sportsman who during his thirty second year successfully undergoes the above tests, one from each group, is immediately allowed to bear the gold badge without his having previously taken the bronze or silver classes. Only one of the badges may be worn at the same time.

Gymnastics.

While the ancient sports of Sweden have recently experienced what may be called a period of re-generation, another and perhaps still more important branch of physical training has for a hundred years enjoyed the blessings of quiet and undisturbed development, viz. the Swedish or Ling's system of gymnastics which has proved most beneficial to thousands of young people who have not been attracted by the various sports. Gymnastics are compulsory in all schools, both great and small, throughout the country while voluntary gymnastics is gradually gaining ground, at least in towns and large communities, but has not, however, become so extended as could be desired. In addition to this, gymnastics is an important item on the programme of physical training in the Army and Navy.

Broadly speaking it may be said that every Swede of both sexes has, for either a

longer or shorter period of his youth, enjoyed the influence of gymnastics, and it can hardly be denied, not even by the most orthodox sportsman, that it is due to this circumstance that such a small nation as ours has been able to gain a leading position among the sporting nations of the world. This cannot be said from a numerical point of view, however, as the Ling's system of gymnastics is altogether too democratic in its character to offer special advantages to certain individuals who have been favoured by nature with exceptional physical qualities. Gymnastics has no time to spend upon such exceptional cases, but leaves them to the influence of sporting organizations. On the other hand, as far as quality is concerned, and not with regard to sporting results, the Ling's system has done *far more for the development of the body from a point of view of gracefulness and beauty*. It is just these qualities which the Swedish system has been so much more successful in producing than the systems practised by other nations, and this is undoubtedly the result of gymnastic training.

During the Olympic Games of 1911 it was an easy matter for the critical observer even at a considerable distance and irrespective of difference in dress, to pick out the Swedes from their excellent opponents. With their shoulders thrown back and heads erect, their soft lithe aristocratic gait they were, from a physical point of view, head and shoulders above their opponents.

From a purely physical and physiological point of view the Swedish system has the very great advantage over all other so-called systems, of being based upon absolutely scientific principles. Its object is not only bodily and moral improvement but it also claims esthetic qualities, without which no movement is what it should be, which is also the sign of a noble and well balanced mind.

A brief account of the system cannot be considered out of place in this article. The primary object of the Swedish system of gymnastics is to create and preserve bodily health and forestall illness, and also to give the individual the qualifications necessary for a healthy mind, based upon the good old rule, "a wholesome mind in a healthy body."

In achieving its object the system is not satisfied with directing its influence to a few parts of the body only, and thereby develop them to the highest state of efficiency, but carefully directs its attention to *each and every one* without exception.

This is done by means of an extremely plentiful supply of movements which are the result of thorough scientific experiment, whose effects in different ways are well known and are, *without exception, of material value in practical life*. These movements are arranged in groups, or in what may be termed "kindred movements," not with reference to apparatus or exterior arrangements but entirely based upon the body's need of exercise. They are combined in "Daily Exercises" which contain one or more representatives of each group.

A day's exercise can be composed of the following movements. First of all the so-called introductory movements are taken, that is to say a short selection from the complete "Daily Exercise" consisting of easy movements from the majority of the groups, with the object of preparing the body for further work. This preparatory stage may be likened to the usual preparations commonly adopted by boys when preparing for a fight; they stretch out their limbs, ease the joints of their knees, throw off coat, collar and necktie, etc.

Then come the *Span Bending Exercises*, chiefly affecting the upper part of the back-bone and back but also benefitting the muscles of the stomach and the organs of the abdomen on account of the acute contraction of the muscles. This movement stretches the large vessels and the fascicles of nerves along the inner side of the back-bone.

Then come the *Heaving Exercises,* that is to say, various kinds of rope climbing and also climbing on poles, ladder, and bars, etc. in which the body in a hanging position is wholly or partially supported by the arms, thus the chief effect is always on the arms and the muscles of the stomach.

Next come the *Balance Exercises* in which the body has to work with a reduced surface of support for the purpose of fostering a more responsive telegraphic connection between the brain and the extremities.

The *Dorsal Exercises* are then taken. These exercises are intended to exercise the muscles of the side of the back and are followed by abdominal movements for those of the front side. These are succeeded by a side to side trunk movement to exercise both sides of the trunk.

The next item consists of marching and running, partly intended to counter-balance the severe effects of the preceding movements, and partly to train the action of the heart and thereby develop the faculty of endurance.

Thereupon, after a short rest or a few easy leg movements instead, *jumping exersises* are undertaken chiefly with the object of producing courage and fearlessness.

The programme is concluded by another selection of movements, although not so complete as the introductory ones. This selection is intended to re-instate the body in its normal condition and to reduce excited respiration etc.

The "Daily Exercise" is gradually increased, partly by the addition of more difficult movements and partly the introduction of several from the same groups, besides which the so-called life-giving or refreshing movements, such as rythmic or tact movements are introduced here and there.

In every instance it is of the greatest importance, partly, to commence at the right end, always proceeding from easy movements to such as are more difficult, which explains why the movements of the different groups are arranged in this order, and, partly—this is the most important point of the whole system—*never to overstep nature's limits*. It will therefore be understood that the Swedish system of gymnastics is suitable for *everybody*, young and old, men and women, and for the sick as well as the healthy. All the leader has to do is to have a clear understanding of what the individual needs, This does not mean to say that he must conduct purely individual gymnastics, at least not so far as healthy people of about the same age and the same sex are concerned, but the system enables him to successfully lead 60 to 70 gymnasts simultaneously.

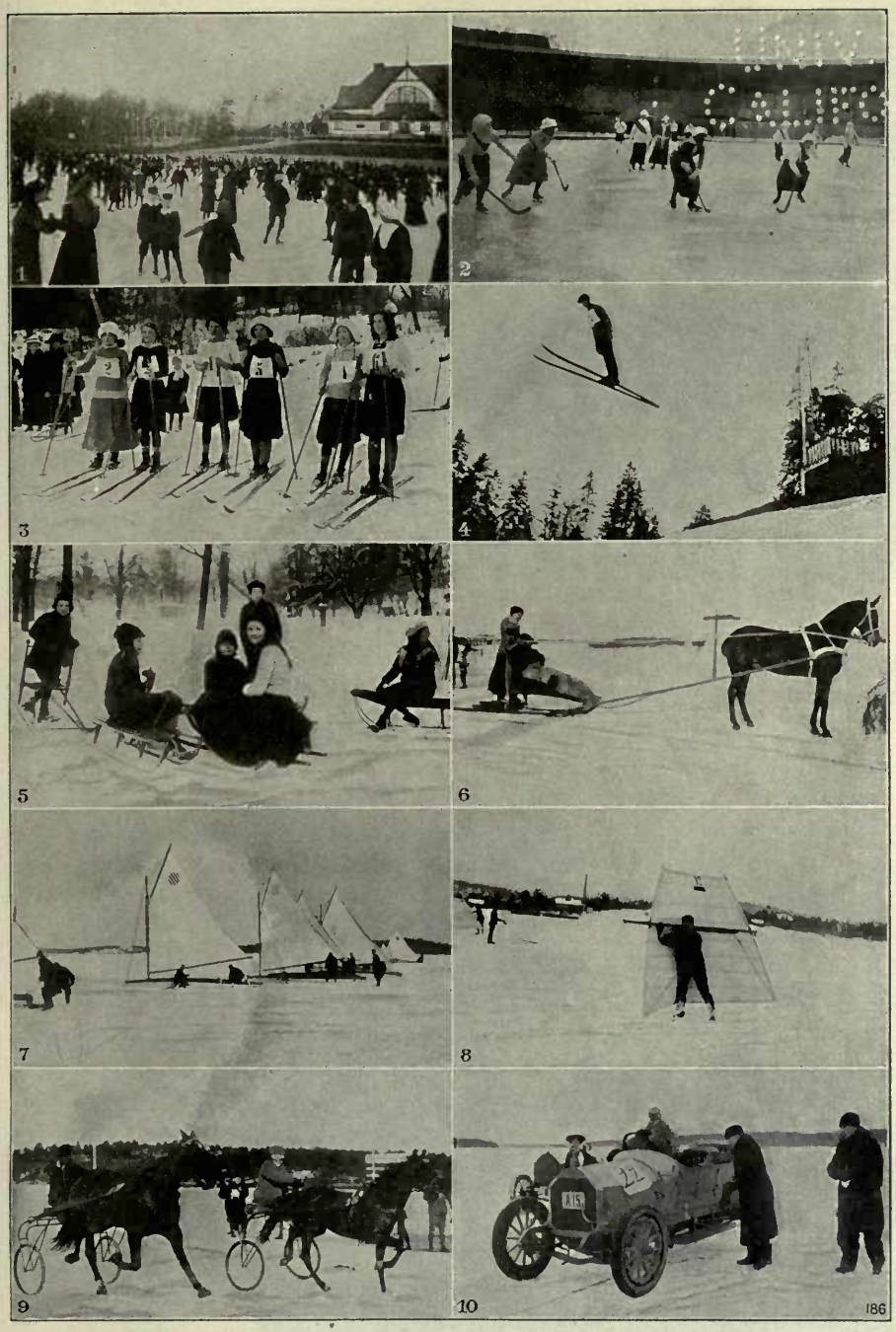
The foregoing should be sufficient to show how extremely advantageous Ling's system is.

Per Henrik Ling, the founder of the system, was at the commencement of the nineteenth century, after many struggles, successful in interesting the various nations in his system and ever since then gymnastics has been regarded as an affair of the State. In all the State public schools gymnastics is compulsory and each pupil receives, on an average, four hours instruction per week until his schooldays close. The same is the case with the national schools in towns and communities, although not on quite such a large scale. Large magnificent gymnastic halls are built in the schools, and nowadays it is becoming more usual to build them in connection with baths, while special teachers are engaged. In the country, however, things are by no means so favourable, often depending upon the lack of means in the community, but in some cases because the authorities have not yet realized the true value of gymnastics. It is worthy of notice, however, that energetic work is being done by "Förbundet för Fysisk Fostran" (The Physical Training Union) which in co-operation with Kungl. Gymnastiska Centralinstitutet (The Royal Central Institute for Gymnastics) are spar-

ing no pains in promoting the welfare of this important work, which therefore gives us every reason to hope that in a not far distant future gymnastics will occupy its rightful position among the various means of improving the health of the nation. However, as regards gymnastics, the State only cared for the Army, Navy, school children and also the students at the universities. On finishing school our young people missed their gymnastics, which even in their early years had acted as a safety-valve for the overflow of their physical energy. The consequence was that *voluntary* gymnastic clubs were formed all over the country in which movement the city of Gothenhurg took the lead in establishing the Gothenburg Gymnastic Society in 1869. During the seventies similar associations appeared in quick succession in Stockholm, Upsala, Gothenburg, Gäfle, Örebro and other places, and nowadays there exists hardly a town of note without its voluntary gymnastic association. These associations, however, consisted almost only of members of the wealthier classes which naturally did not satisfy real lovers of gymnastics. "Gymnastics for *everybody*" was Ling's motto which also became the motto of our gymnastic leaders.

"Stockholms Allmänna Gymnastikförening" (The Stockholm Gymnastic Association) was founded some years ago in order to provide an opportunity for gymnastic training for the less well-to-do for a very small fee, or no fee at all, and Gothenburg soon followed suit by founding the "Ling Society." The province of Scania was not far behind and now-a-days, thanks to military initiative, voluntary gymnastics flourishes there enormously. There is at present an eager interest in gymnastics all over the country which 10 years ago would never have been dreamed of. Thousands of men, women and children turn to gymnastics as a means of healthy recreation.

As regards the training of gymnastic teachers of both sexes, this is chiefly done at The Central Gymnastic Institute, which up to the present has preferably supplied the requirements of the Army, Navy, the public schools, and girls' schools. There are, however, a number of private institutes in Stockholm, and one at Lund for the training of lady teachers.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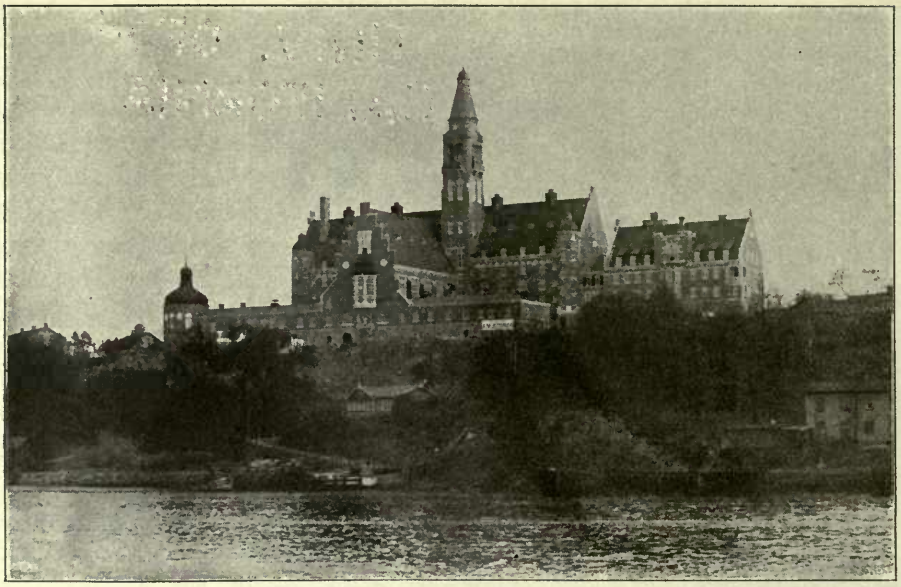
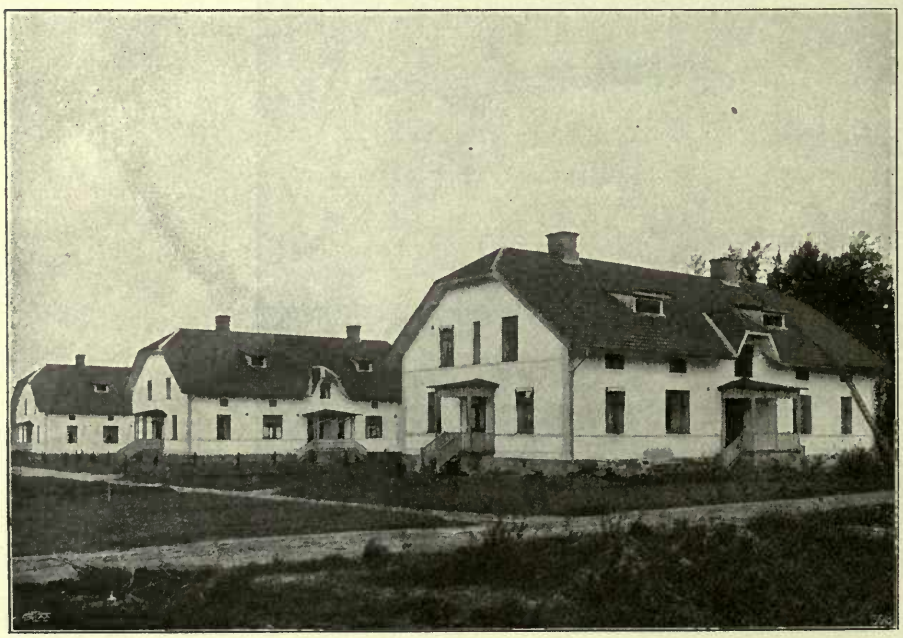


THE DANVIKEN HOME FOR
OLD AND DESTITUTE



WORKMENS HOMES
AT MUNKFORS

SOCIAL CONDITIONS.

At the present time one observes in nearly all civilised countries deep currents of opinion tending to reform society, which are unlike previous attempts at reform in-as-much as they have penetrated down into the masses of our population. Owing to the high standard of education enjoyed by the Swedish people and their ancient political freedom, these movements have become endowed with great force; and when viewing the development of the social conditions of our country certain features present themselves that bear witness of the fact that the Swedish people have, in this direction as in others, pursued their own way.

For the purpose of illustrating one phase of this development, namely, that which concerns the social conditions, some statistical data are given in the following pages, as also the most important laws in connection therewith.

Work and Wages. That part of the population which derives its sustenance from agriculture is calculated to have sunk from 72% to 48% from 1870 to 1910. During the same period the industrial population has risen from 20% to 45%.

The number of hands engaged on the soil is estimated at 1.2 mill. On an average farm hands work $10^1/_2$ hours in the summer not including intervals for meals, etc.; during the darker period of the year their working time is considerably shorter. The wages of the large mass of farm hands consists, partly, of cash, partly, of board and lodging (for statutory labourers and domestics), or in the shape of allowances in kind consisting of milk, grain, potatoes, etc., etc. (such farm-servants are called "statare"). It is, of course, difficult to obtain a reliable means of estimating the value of "allowances in kind" for the sake of comparison.

The number of hands employed in industry, commerce, and the various means of communication is reckoned at 550,000. Of the 335,000 workmen included therein whose trades are classified, 4% are employed in the stone industry, 5% in mining, 12% in the iron-industry, 11% in mechanical industry, 15% in the timber industry, 4% in the wood pulp industry, 12% in the textile industry, and 37% in various other industrial occupations.

According to an investigation for the year 1905 the nett working-day varied betwen 8.5 and 10.6 hours per day for the different trade groups, and constituted an average of 10 hours for all the groups. A summary idea of the extent of the wages in the various industrial trades may be formed based upon reports of the working days lost during the great strike of 1909. According to these reports the daily wages for painters amounted to Kronor 5.04, builders Kronor 4.69, hat-makers Kronor 4.49, and workmen employed in the newspaper printing offices were paid a daily wage of Kronor 4.45. It should be pointed out that these figures represent only the *average value* of the day's

work of both old and young, male and female hands, more or less qualified. In consequence of this the average daily income calculated is especially low for such trades that give employment to large numbers of women.

Organization. The trades-union movement did not gain a footing among the wage-earners of this country until a quarter of a century after the introduction of free trade and the great Swedish industry resulting therefrom. During the 1880 decade trades-unions began to make their appearance in various places, and in the majority of our industries. The initiative was generally taken by the social democratic organizations, through which the foundation was laid for the intimate co-operation that exists between the working-men's trade's union and political movements in Sweden. The trade organization system in Sweden has been founded on the model of its Anglo-german predecessor. For instance, the workmen in an industry at a certain place are attached to a local trades-union, which is a branch of the trades-union of the whole country. The majority of trades-unions in their turn belong to one central organization for the whole country, viz. "*landsorganisationen.*" The co-operation between the trades-union movement and social democracy is effected by the local political organizations, the workmen's local associated unions being composed of the different trades-unions at each place. A trades-union can decide by the majority of a single vote whether they shall join the local associated union or not; the minority may reserve themselves and are thereby freed from the obligation of paying party fees.

In April 1912 the trades-union movement reckoned 38 different trades-unions with 1,966 local branches and 116,849 members.

The employers also possess powerful unions, which work for the regulation of the conditions of work in their own interests. In the year 1902 the Svenska Arbetsgifvareförening (The Swedish General Employers' Association) was founded, and acts in the interests of the great industries, the most important branches of which are represented by different industrial associations such as Järnbruksförbundet (The Iron Works' Association), Textilindustriförbund (The Textile Industry Association), Sågverksförbund (The Timber Industry Association), etc., etc. At the close of 1913 the association consisted of 1,209 employers and 160,241 workmen.

The mechanical and shipbuilding industry is represented by an independent organization, namely, *Sveriges Verkstadsförening* (The Swedish Engineering Works' Association), which in 1913 had 189 members with 29,492 workmen.

Building is represented in the *Centrala Arbetsgifvareförbundet* (The Central Association of Employers), which must comprise about 2,000 employers with about 40,000 workmen.

During the last few years there has been a marked tendency towards centralization among the various employers' associations, and plans have been drawn up for co-operative work with corresponding organizations in neighbouring countries.

Strikes. During the years 1903—12 altogether 1,878 strikes have occurred, through which 15,937 employers and 488,253 workmen have been affected. Of these conflicts 573 were settled on the basis of the conditions laid down by the employers, and a like number in accordance with the claims of the workers, while the remainder resulted either in compromises, or the results were unknown. The great strike of 1909 and the lockouts in connection therewith affected, in all, 8—9,000 concerns and about 300,000 workmen, each one losing 37 working-days.

Intervention in Industrial Conflicts. According to the law on compulsory intervention in industrial disputes of 31st December, 1906, the country is divided into certain districts for each of which the government appoints a mediator, whose duty it is to endeavour to solve disputes between employers and workmen, and also between the employers themselves, and between the different groups of workers. There are 7 such districts.

Should a dispute arise in a district and cause or threaten to cause a big strike the mediator shall intervene. Should the negotiations between the disputing parties result in no agreement, the mediator shall exhort them to submit the matter to arbitration. The mediator is not allowed to act as arbitrator.

During the years 1907—12 the mediators intervened in 287 cases, of which 190 cases in which strikes had occured. In 242 cases the mediator was successful in making agreements. Concessions made by both parties were usually the basis of settlement.

Collective Labour Agreements. The system of collective agreement is very widely used in Swedish industrial life. This system reached its climax at the beginning of the year 1909, when the number of such agreements was more than 2,000, by means of which working conditions were regulated, either direct or indirect, for more than 300,000 workmen. The number of collective agreements became considerably reduced after the general strike of 1909. This form of agreement, however, comprised no less than about 230,000 workmen at the close of 1912, that is to say, close upon half of the total number of workers employed by industry, trades, commerce, and the various means of communication.

Employment Agencies. The official employment agencies in Sweden are the result of initiative taken by the municipal authorities. Nowadays these agencies enjoy economical support from the State. At the close of the year 1912 there were 32 agencies with 61 branch offices, and only two out of the 24 provinces are without official employment agencies. During the same year the number of applications for work amounted to 190,220, vacant situations to 152,500, replenished situations to 105,000, of which 25,800 were in connection with farming. These official agencies have aimed especially at supplying agriculture with labour, and in that respect are able to show very favourable results.

Emigration. Sweden has lost over 1 million inhabitants through emigration (chiefly to America), that is to say, nearly one fifth of its present population. The causes of emigration are of a very deep-going nature; they have their roots in the economical and social conditions, and in certain psychological peculiarities of the people.

It is only during recent years that direct practical steps have been taken to stop the tide of emigration. The most important work in this connection has been the services rendered by "Nationalförening mot emigration" (The National Antiemigration Society), founded in 1907, which is economically supported by the State, County Councils, agricultural societies, and municipalities. This society seeks to further a staunch and objective policy concerning questions touching emigration, and also spreads information on the conditions of life in Sweden and America. By acting as intermediary in the sale of ground, the establishing of "own-homes" and the improvement of dwelling houses, the society seeks to provide increased opportunities of earning a livelihood and more agreeable conditions of life in the homeland.

The Housing Question. The housing question has recently attracted more and more attention. As time goes on it becomes more and more obvious that healthy and cheap dwellings are perhaps the most important condition for a successful struggle against disease, drink, immorality, and other social evils. The housing question in our large towns and quickly growing industrial centres is most urgent, where speculative building enterprises are not able to provide the needs of the working people, and in consequence thereof comprehensive steps from other quarters have been seen to be most essential.

The law of 1907 concerning the planning of towns and their division into plots invested municipal authorities with increased power regarding the regulation of the building up of the towns. A new law relating to house letting appeared the same year by means of which the tenants' right as concerning the landlords was extended, besides which an attempt was made, by means of modern legislature regarding lease-hold and servitute, to create a new means of transferring building plots for the purpose of forestalling speculation and the consequent rise in prices.

In the year 1912 a commission was appointed to investigate the housing question and to make a proposal as to what steps ought to be taken by the State. In connection herewith a complete investigation into the dwelling conditions has been commenced. The out-of-date rules and regulations for building and also for public hygiene are at present being revised.

The municipal authorities, especially in the large towns, have adoptedvarious measures to provide cheap dwellings. The City of Stockholm, for instance, has granted to philanthrophical building societies and companies a loan of 2.25 million kronor in all, at a low rate of interest, and has let out building plots with an area of 50,000 sq. meters on very favourable terms. A matter of still greater importance is that during the years 1904—10 the city authorities have purchased 2,949 hectares of ground valued at 8 million kronor, for the purpose of building "own homes."

In some towns the dwellings are placed under inspection.

The building of dwelling houses through self-aid goes on to a certain extent. In the year 1911 there were 590 registered societies whose object it was to procure apartments for their members in houses either built or purchased by them.

The "Own Home" Movement. In eliminating the obstacles caused by the law against the division of the land into small lots, the State has paved the way for the progress of the modern "own-home" movement.

The decision of the Diet in 1894 enabled the less well to do to purchase "own-home" tenements from the crown on easy terms. Up to the year 1912 there were about 1,800 own-homes. In the most northernly part of the country there are, besides, 1,204 plots for cultivation let out by the State.

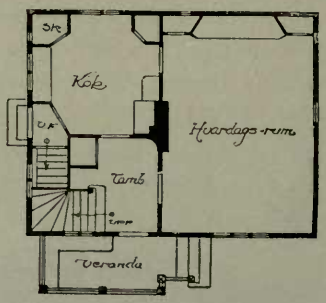
Cheap State loans have been granted for the establishment of own homes. During the years 1905—12 11,129 loans were granted by the "Own Home Loan Fund" for a total amount of 28,579,935 kronor. The loans were chiefly obtained through the agency of agricultural societies, special companies, and associations.

During recent years successful work has been done in creating colonies of small farms by detaching plots from large and well situated farms. For this purpose there was founded a land agency fund in 1907, which granted loans to companies and associations up to $^4/_5$ of the value of the estate and at 4% interest. These loans have generally to be re-paid within a period of 5 years.

HOME FOR SICK CHILDREN

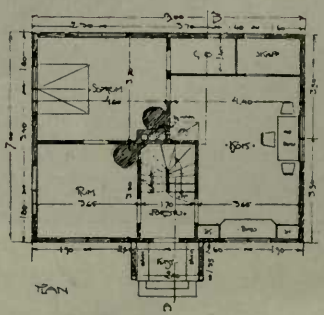
CHILDRENS' SUMMER RECREATION HOME (LINGSLÄTTÖ)

"HOME FOR THE AGED" AT ENSKEDE



Plan of Bollenvän..

WORKMAN'S HOUSE AT ENSKEDE, STOCKHOLM



FARMER'S COTTAGE AT BANKESTA

Co-operation. Co-operative societies of the English type began to make their appearance at about the middle of the last century. It was, however, not before the associations, through the law of 1895 (revised 1911), were given the opportunity to become fully legalized by means of registration, nor did the co-operative system make itself keenly felt until a central organization, viz, The Co-operative Union, was founded in 1899. In 1913 543 societies with 128,757 members belonged to the union. The turnover amounted to 6,744,347 kronor in the year 1912.

Co-operation has become a factor of exceptional significance in connection with agriculture. The purchase societies working in this sphere have become amalgamated and formed the Svenska Lantmännens Riksförbund (The State Union of Swedish Farmers) which in 1912 had 850 local branches and about 40,000 members. The turnover of the central associations belonging to the Union amounted in the afore-mentioned year to 18 million kronor.

In 1912 there were altogether over 5,300 economical associations registered, of which about 2,000 were farmers' associations, 1,500 building societies and 1,100 co-operative societies.

Workmen's Protection. In the Swedish laws concerning the protection of working men there are especially three important laws that first attract our attention, viz, the law for protection of 29th June, 1912, the law concerning the prohibition of the employment of women for night-work in certain industrial enterprises of 20th November, 1909, and the law of 5th June, 1909, forbidding trading during certain hours of the day.

The most characteristic feature of the first-mentioned law is its general applicability. Its object is to forestall or eliminate all the wrongs connected with the laws for protection, independent of the trade in which such wrongs occur, or the group of workmen affected thereby. This means that the law is principally a foundation of workmen's protection law, the decisions of which need further completion in many ways, if they are to be effectively applied in connection with different trades.

This law may be applied in connection with all enterprises, industrial or otherwise, in which workmen are employed and also to such as work on buildings, road and water-constructions, draining or other similar kinds of special work. Certain kinds of work (stated in the law) do not come under the influence of this law.

In order to avoid accidents and prevent bad health employers are compelled to observe all restrictions and means that are considered necessary for the protection of workmen in their employ. For instance, it is the employer's duty to see that covered working premises are supplied with sufficient breathing space, in general, not less than 10 cub. m. for each hand. There must also be an efficient system of ventilation.

Those who are under age (under 18) must have passed through the public school and have reached a certain age, which is generally fixed at 12, but for industrial work at large concerns, employing at least 10 hands or at least using 5 H. P. the age is fixed at 13 for boys and 14 for girls. Workmen under 15 years of age may not be employed for underground work in quarries or mines.

Concerning the employment of such as are under age in industrial work, it is prescribed that the daily hours shall not exceed 6 hours for such as are under the age of 13. Those who are 13 are allowed 8 hours, while the remainder are permitted to work 10 hours. Minors are not allowed to work between 7 p. m. and 6 a. m.

Women are forbidden to work underground in quarries and mines, nor are they permitted to work at industrial concerns during the first six weeks after child-birth. Employers cannot refuse a woman to be free from work during the two weeks previous to her expected confinement.

The government has the right to stipulate rules for the strengthening or mitigation of the afore-mentioned instructions, as occasion demands.

There are 10 inspectors (of which one is a female) with 11 assistants, 6 inspectors of mines, 18 sub-inspectors, all under the "Socialstyrelsen" (The Royal Labour Department), whose duty it is to see that the law is duly applied. There are also the municipal authorities with similar duties, viz, the Board of Health or the district council.

The law concerning women's night work states that a woman, employed at an industrial concern having more than 10 hands, may not be employed to such an extent that she is unable to enjoy a stretch of 11 hours freedom from work each day of 24 hours between 10 p. m. and 5 a. m. In such enterprises engaged in season-work, as also by way of exception in other concerns where the work, owing to special circumstances, must be forced, the continuous interval of rest, at the most altogether 60 days of the year, may be reduced to 10 hours per day. As regards such businesses carrying on the preparation of goods that are subject to sudden deteioration, the government has the right to make special decisions.

The validity of the law on the closing of shops, which refers to towns, country towns and municipal communities, is limited in extent, in as much as the local authorities have the right to prohibit the carrying on of trade in accordance with the decisions of the law mentioned.

If such a prohibition is issued for a certain place, a definite time for the opening and closing of shops shall be given, in such a way, however, that the opening time is not earlier than 7 a. m. and the closing time not later than 8 p. m. Shops trading in provisions only may be allowed to open at 6 a. m. and for the same kind of shop, and also such as chiefly trade in tobacco or newspapers the closing time may be as late as 9 p. m. The evening preceding Sundays and holidays, and also during the two weeks immediately preceding Christmas Eve all shops are allowed to close an hour later than usual.

Sick Funds. Sick Cash movement is the most extensive popular movement of the country. It originated in the first instance in the days of the guilds. It was not, however, until the latter half of the nineteenth century that it began to extend to any considerable extent.

The Sick Cashes are regulated by a law of 4th July, 1910. At the same time that this law leaves the character of the sick cashes as voluntary associations on the whole unchanged, it endeavours to create a guarantee for the work of these funds being organized according to principles that agree with their social task. For this purpose the Labour Department, with whom registration is made, has been commissioned to exercise a control over the sick funds.

In the year 1910 the number of registered sick funds was 2,426 with 632,005* members. The number of women was about one third of that of the men.

The income of the sick funds amounted the same year to 8.2 million kr., and the expenses to 7.3 million. Their total funds amounted to 12.7 million kr. The amount forsupport for each case of illness was, on an average, 30.29 kr. and for each day of illness 1.36 kr.

The above-mentioned amount of income includes a State grant of 500,000 kr. This has since been increased to 1,256,800 kr. There are, besides, special State grants for sick funds that offer maternity support.

* These figures include certain double calculations on account of the fact that, occasionally, persons are members of several sick funds at the same time. In reality the sick funds must comprise *500,000 individuals.*

Support and Pension Funds. Self-aid societies coming under the heading of "Support and Pension Funds" vary very considerably in character. There are, for instance, private, compulsory funds—to which are included such as are established for certain groups of State employees—others are public, and admission to them is voluntary. Then again, distinction can be made between funds that guarantee their members pensions, and such as give annual support to members' widows and children. Many of the funds are arranged with fixed subscription payments in proportion to the amount of pension. In certain cases the amount of pension depends upon the means at the disposal of the fund and the number of members in receipt of support.

The work of the funds in question is regulated by the law of 29th June, 1912, concerning societies for the purpose of financial support.

According to the figures for 1912 there were 304 pension funds in existence with 27,786 pensioners. Their total assets amounted to 217 million kr.

Accident Compensation. If a workman is hurt as the result of an accident while doing his work, his employer is compelled to compensate him in accordance with the law of 5th July, 1901. This law is applicable to all kinds of industrial work, and the loading and discharging of merchandise, railway and tramway traffic, and the building industry, etc., etc. On the other hand it is not applicable to agriculture or shipping.

If the accident causes a considerable reduction of the injured person's working capacity during more than 60 days, then 1 krona per day shall be paid in compensation from the 61st day. If the accident causes invalidity, then shall an annuity corresponding to the reduction of the injured persons working capacity be paid him, which shall not exceed 300 kr. If an accident results in death an amount of 60 kr. shall be paid for the funeral expenses, besides which an annuity of 120 kr. shall be paid to the widow, and 60 kr. to each child under age.

Employers have the right to insure their workmen in Riksförsäkringsanstalten (The State Insurance Department) against accidents, whereby they are freed from the duty of paying compensation. It may also be mentioned that employers have made extensive use of this right.

Public Pension. Invalidity and old age insurance was introduced in Sweden by the law on pension insurance of 30th June, 1913. This law enacts that the majority of the Swedish people between the age of 16 to 66 must be insured. The premiums vary according to the income. Persons in the service of the State, among others, are exempted from this obligation.

The annual fee is 3, 5, and 8 kr. for insured persons with income of 500, 500 to 799 kr. and 800 to 1,199 kr. respectively. If the income amounts to 1,200 kr. or more, an annual fee of 13 kr. shall be paid.

Pensions are paid in case of permanent incapacity to work, and at the latest at the age of 67. The amount of the pension for men is 30 % of the total fees paid and for women 24 %.

In case of invalidity an addition to the pension is also paid to pensioners whose income is under 300 kr. for men, and 280 kr. for women. This addition shall not exceed 150 kr. for men and 140 kr. for women. Besides this the pension addition is increased by 0.08 % for each krona of the fully paid pension fees.

Besides compulsory insurance there is voluntary insurance which is open to all Swedish

men and women who have reached the age of 15. The minimum annual fee is 1 krona and the maximum fee 30 kr. The pension is paid in case of permanent incacity to work, and at the latest at the age of 67. For men it is 1½% of amount of the fees for each complete year that has passed since the day the fee was paid to the day when the pensioner first comes into receipt of pension. Five sixths of the corresponding amount for men is reckoned as the amount of pension for women.

The management and administration of the pension system of the whole kingdom is under the control of a department, especially established for that purpose, called *Pensionsstyrelsen* (The Royal Old Age and Disablement Insurance Department), to which all local pension committees are subordinated. The Board is the authority that has to consider all applications for pension, concerning which the committees have only to decide whether the applicant has the right to a pension or not. The amount is calculated and determined by the department. The payment of pensions is executed through the post office.

Social Administration. The central authority for all social matters is *Socialstyrelsen* (The Royal Labour Department) which commenced its work on 1st January, 1913. This board is under the Home Office which at the same time took over the management of social matters in general.

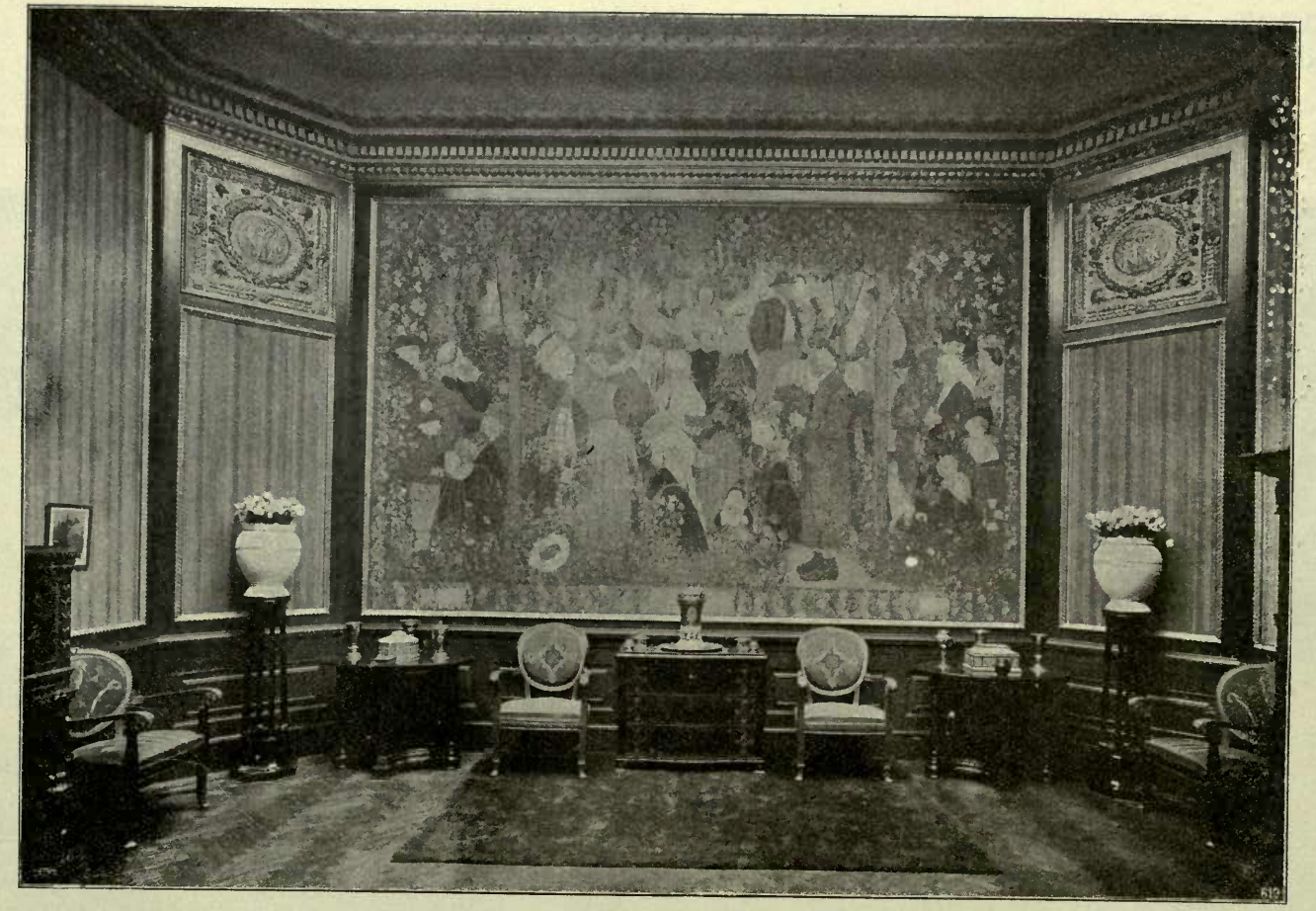
It is the duty of the Royal Labour Department to consider the conditions of the supply of work and workers, the connection between employers and employed, workmen's protection, advisable means for the promotion of social prudence, and other questions intimately connected with social work.

The Department is the supervising authority over trade inspection, sick-funds, and also exercises control over employment agencies and the State mediators who act in cases of dispute. It is also the duty of the Department to control societies giving mutual financial support.

The Labour Department is supported by a Social Council, composed of employers, workmen, and other experts, whose object it is to give advice and come forward with proposals concerning matters confided to them, and also to stand by the Department ready to place their knowledge at their disposal and to supply information and practical ideas.

The Riksförsäkringsanstalten (The State Insurance Department) and Pensionsstyrelsen (The Royal Old Age and Disablement Insurance Department) have each their own special task alotted them. The duties of these two departments have already been referred to.

THE NORTHERN MUSEUM
IN STOCKHOLM



NATIONAL MUSEUM AT STOCKHOLM:
THE BOBERG ROOM, MODERN INDUSTRIAL ART

INDUSTRIAL ART.

Sweden's industrial art, as also her domestic industry, is of very ancient origin. The geographical position of the country, far distant from European centres of art and industrial art, has prevented her following the great revolutions that have from time to time taken place in connection therewith, but on the other hand, it is just our remote position that has protected us from the danger of experiencing the effects of such smaller and less significant movements which have frequently caused European taste to liken a weathercock, blown in all directions according to the capricious winds of fashion.

We have thus been able to preserve a considerable element of native tradition in patterns and models, which has served as a sound basis upon which Swedish Industrial Art has been able to build and continue its development, and which has also rendered it possible for Sweden to enter into foreign competition with success.

Being conscious of the truth of the foregoing industrial art *workers* have become courageous and therefore allowed themselves to be represented at a number of international exhibitions, namely, Chicago 1893, Paris 1900 and recently at the Baltic Exhibition at Malmö 1914. Their exhibits at these centres have undoubtedly done honour to the country and her position within the sphere of art.

Broadly speaking it may be said that Swedish industrial art has, in its development, been strongly influenced by the tendency of French taste and has almost entirely followed the lead of France, and here in Sweden the great Revolution was a crushing blow to art and industrial art just as it was in France.

This overwhelming movement for liberty, which in this country culminated in the murder of Gustaf III did not, it is true, develop into a revolution although it signifies a notable conclusion of a brilliant period during which art in furniture, porcelain, and metal celebrated complete triumphs in gorgeous and delicate treatment of detail, not merely under the light wand of the rococo period but also later when the return to the strict forms of the antique characterized the style of Louis XVI or what we are accustomed to refer to as the "Gustavus Style" ("Gustavianska Stilen").

From the days of Bellman and Gustavus III, a period of which it has justly been said *"that it longed for the beautiful and also understood how to accomplish it,"* we are able to reckon the rosiest period enjoyed by our oldest porcelain factory, namely, RÖRSTRAND which, founded in 1726, has up to the present day carried on a considerable manufacture of faience and porcelain of an artistic nature, as well as of a ruder kind.

In the year 1827 another porcelain factory of equally high repute was founded, namely, GUSTAFSBERG, which together with the afore mentioned still continues to share the honour

of being the formost within the branch in Sweden. The productions of these houses, which have rightly been so highly treasured, adorn the majority of European museums.

The "Empire Style," which receives its nomenclature from Napoleon, like the French Army, entered upon a victorious campaign through the world and even stamped Swedish industrial art with its dictatorial character. In Sweden it was called "Carl Johan Style" and comprises the period from the murder of Gustaf III to the close of the reign of Charles XIV John, and later on, after a period of vacillating decadence, experienced a legitimate revival at the commencement of the nineties.

Such was the position in the middle of the nineteenth century, not only in Sweden but throughout the whole of Europe. The "Empire Style" which had outlived itself was in the convulsions of death; decorative art had changed to get into a cul-de-sac. After a vain attempt to seek delivery by means of adopting an imitation of nature devoid of style which merely made the position still more desperate the reaction came from England after the first world's exhibition in London—a reaction which was to become the guiding influence for modern industrial art.

Museums and schools for industrial art, the study of Swedish domestic industry, and of valuable old productions from the glorious days of the Orient, the Antique and the early Renaissance were the means by which the modern movement achieved its purpose in Sweden.

THE SWEDISH SLOYD ASSOCIATION (Svenska Slöjdföreningen), THE ART NEEDLEWORK ASSOCIATION (Föreningen Handarbetets vänner), THE NORTHERN MUSEUM (Nordiska Museet) and THE NATIONAL MUSEUM (Nationalmuseet) in Stockholm, as well as THE HISTORICAL MUSEUM OF NATIONAL CULTURE (Kulturhistoriska Museet) at Lund — all founded with this object in view — have each in its own way exercised an ennobling and fostering influence upon modern industrial art which from this period has had a continual upward tendency.

THE SWEDISH SLOYD ASSOCIATION, founded in 1845 with the object of "encouraging sloyd-work and industries" has, in establishing *The Technical School* in Stockholm, strongly contributed to the development of Swedish art handicraft, and by arranging special exhibitions, prize competitions, stimulating lectures and by publishing a periodical magazine the Association has exercised an exceptionally beneficial and wide-spread influence.

THE TECHNICAL SCHOOL IN STOCKHOLM, which commenced its career as an insignificant Evening and Sunday School, has developed to such an extent that it is now visited by more than 2,000 pupils and employs over 100 teachers, has among other things through the medium of a special department styled THE HIGH SCHOOL OF INDUSTRIAL ART, provided a foundation for the training of the numbers of clever pattern designers and industrial art workers who have won for themselves such an excellent name, and who, by their designs and work, especially in the textile department, have been rewarded with so much recognition and praise in various parts of the world. Among other schools working for the same purpose, THE SLOYD ASSOCIATION'S SCHOOL AT GOTHENBURG, and THE TECHNICAL SCHOOL AT ESKILSTUNA should also be mentioned.

THE ART NEEDLEWORK ASSOCIATION (Föreningen Handarbetets vänner) was founded in the year 1874 by a number of artists and others interested in art in Stockholm. This society was destined to prove of the greatest importance, especially as regards textile work. The association aimed at giving an artistic and national character to Swedish handicraft by introducing into modern textile art the old Swedish peasant patterns and colours, to revive the old national dresses, the valuable old laces and embroidery, and thereby make an attempt to elevate the public taste in the interests of art.

The association has continually endeavoured to promote these highly praise-worthy aims with never relaxing energy and in spite of considerable economical difficulties, and their extensive collection of valuable Swedish peasant weavings, laces and embroidery, their classes in art-sewing and weaving, their annual exhibition which attracts so much attention are too well-known to need special mention.

Among the modern lady artists at present in the service of the Association are Carin Västberg, Maria Sjöström, Annie Frykholm, Agnes Sutthoff and others.

Two other institutions, which carry on their work almost like ordinary business firms, have met with undeniable success in a similar branch of art. S. GIÖBEL'S SWEDISH ART SLOYD EXHIBITION (Svensk Konstslöjd utställning S. Giöbel), in connection with which the leading artists have been, Selma Giöbel, Alf. Wallander, I. Ståhlbrand etc., and NORDISKA KOMPANIET'S TEXTILE DEPARTMENT, in connection with which Thyra Grafström, Martha Christiersson and others deserve to be mentioned.

As far as the first mentioned firm is concerned it may be added that besides textile art, they have also interested themselves in porcelain, furniture and metal work.

From THE ART NEEDLE-WORK ASSOCIATION sprang a society of equal importance some years ago, named "Licium." This society's very estimable work has chiefly been in the interests of Church and Heraldic Textile Art, and has been led by the following lady artists: Agnes Branting, Mimmi Börjesson, Hedvig Eichhorn, Sofia Gisberg, Eivor Hedwall, Lotten Zeinvoldt and others.

Under the chairmanship of H. R. H. Prince Eugén, THE STATE UNION OF SWEDISH DOMESTIC INDUSTRY ASSOCIATIONS has long shed a uniting and encouraging influence on Sweden's sloyd-work with the support of generous grants from the state and provincial agricultural societies, and through maintaining a permanent exhibition of porcelain, furniture, hardware and textile work it has offered the public an opportunity to study the productions of the artistic energy the associations possess in the persons of Lilli Zickerman, Elsa Svensson-Gullberg, Hilda Starck-Lilienberg, Maja Alvin, etc.

Among the societies that have more recently come into existence also for the purpose of furthering the interests of industrial art are THE INDUSTRIAL ART WORKERS' GUILD (Konsthandtverkarnas Gille) and THE INDUSTRIAL ART ASSOCIATION (Föreningen Konsthandtverk), both of Stockholm.

As will be seen from the foregoing very substantial efforts have been made to refine Swedish industrial art since the middle of the nineteenth century, and the fruits of these efforts have proved considerable to its various kinds of work, although some have benefitted more than others.

It is chiefly in connection with the textile industry that Swedish craftsmen have achieved their greatest successes, and we dare to say that Swedish textile art has, at the present time, reached a state of perfection which as regards genuine design and refined colour treatment is without comparison in the world.

On the other hand it must, however, be admitted that it is hardly possible to express an equally satisfactory opinion concerning the other branches of industrial art even though most of them, such as bookbinding and hardware, from an artistic point, are thoroughly well advanced.

The RÖRSTRAND and GUSTAFSBERG porcelain factories, the former enjoying the artistic talent of Alf. Wallander, Knut Almström, E. H. Tryggelin, and Algot Eriksson, the latter under Gunnar Wennerberg, Herman Neujd and Beata Mårtensson, have each in its own individually characteristic way, brilliantly succeeded in keeping in the foremost rank in competition with abroad, not only as regards the choice quality of the articles themselves and their glaze but also in bestowing upon them the charm of artistic form.

Turning our attention to Swedish furniture art we find that it too, at the time when the Empire Style ceased to reign, was forced to undergo a period of decadence, aimlessly searching for some means of expression, till in the seventies and eighties, as though with a feeling of despair, it threw itself into the arms of the German Renaissance. The Empire Style re-appeared in the nineties in a modernised form, and soon predominated art in Swedish furniture especially as represented at the ART AND INDUSTRIAL EXHIBITION OF STOCKHOLM in 1897.

Even in this connection, however, a reaction soon made itself felt. Lighter and, above all, more artistically independent forms began to appear more prominently, and several of the best known Swedish architects, such as Ferdinand Boberg, Carl Westman, Axel Lindgren, Carl Bergsten and others, have gradually succeeded in giving Swedish furniture art and room decoration stately and individual characteristics, and have created a series of types for future development.

Iron work, which during the first decade of the nineteenth century was considerably neglected and unjustly enough was about to find its place usurped by objectionable cast-iron forms, has long ago experienced a very legitimate revival, in connection with which Swedish architects and art iron-work designers, namely, Petrus Forsberg, Olga Lanner and others, have taken a very active part.

Swedish book-binding handicraft has for many years occupied a prominent and much respected position, and both MESSRS. F. BECK AND SON and GUSTAF HEDBERG are well known by their exhibits in Sweden and abroad.

Swedish glass-ware is well represented by the two firms, KOSTA and REIMYRE BRUK, while the goldsmith's art has excellent exponents in C. G. HALLBERG, GUSTAF MÖLLENBORG, K. ANDERSON and THE GOLDSMITHS' COMPANY (Guldsmedsbolaget).

From the above report the conclusion may be drawn that Swedish Industrial Art has at the present time, in many of its branches, reached a praiseworthy stage of development, and that it is steadily on the upward grade. It is therefore much to be regretted that the great world's war at present being contested will probably paralyze even the home market for some considerable time to come, which means that Swedish craftsmen working in the interests of Industrial Art, must of necessity experience the strain of a temporary reduction in the sale of their products.

PART III.

ADVERTISEMENTS

TO THE NORTH CAPE BY RAIL THROUGH SWEDEN.

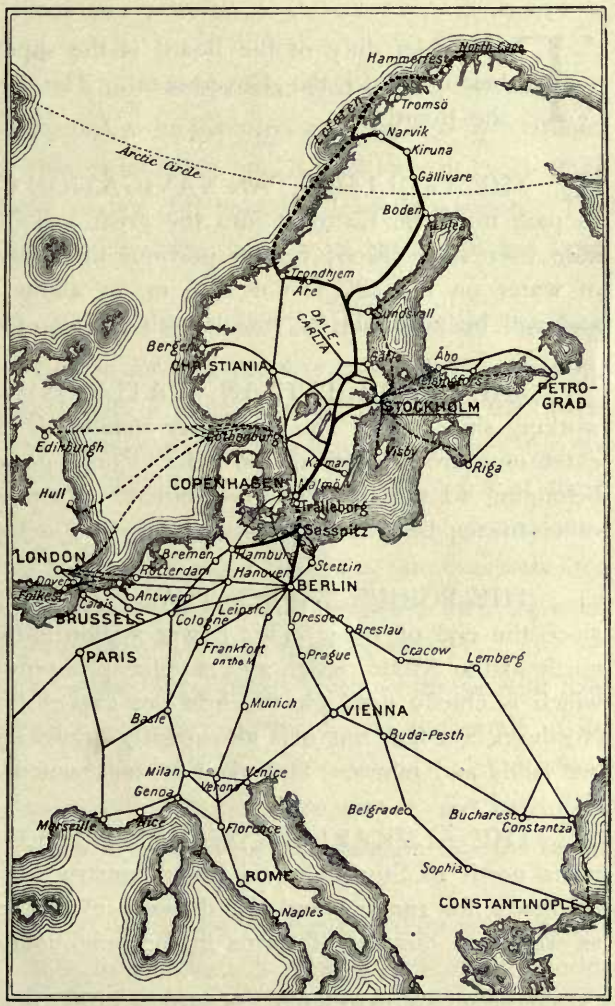
THE NORTH CAPE is reached in the quickest, most comfortable and cheapest way

BY RAIL THROUGH SWEDEN.

From BERLIN or HAMBURG to NARVIK, near the Lofoten in Norway, the journey is accomplished in about 60 hours. This railroad passes the world-famed mining district of Kiruna. From NARVIK there is steamboat communication arranged, northwards to the NORTH CAPE, and southwards to TRONDHJEM. From Trondhjem to STOCKHOLM is a railroad-journey of about 24 hours.

Through-Carriages, also Sleeping-Cars, Berlin—Stockholm over Sassnitz—Trälleborg, as well as Stockholm—Narvik and Trondhjem—Stockholm.

The steam-ferries on the route Sassnitz—Trälleborg are the largest and most comfortable in Europe and provided with all modern inprovements.



For particulars apply to any of the various Tourist Agencies, especially those of Messrs Thos. Cook & Son or the SCHWEDISCHES REISEBUREAU, 22/23 Unter den Linden, *Berlin*, where Tickets for the above carriages may be obtained.

KUNGL. VATTENFALLSSTYRELSEN

(ROYAL BOARD OF WATERFALLS)

STOCKHOLM.

THE chief duty of the Board is the supervision of the navigable canals and waterfalls belonging to the Government. The greatest enterprises subject to the control of the Board are:

THE TROLLHÄTTAN NAVIGATION CANAL. This waterway which enables vessels to pass from the Kattegat into the great Lake Vänern has in its entire length been trafficable ever since 1800; certain portions of it were finished as far back as 1607. The depth of water on the sills is now 2,97 m. = about 10 ft, but the canal is under reconstruction. and will be available for vessels with a draft of 4 m. or something like 13 ft in the year 1916.

THE TROLLHÄTTAN WATER POWER PLANT, on the Göta River, has been working since 1910. The machinery installed is capable of producing 80,000 H. P., but further extensions are now going on. The electric power and energy from this the first power station belonging to the Swedish Government is distributed to the city of Gothenburg and several other towns, besides being drawn upon by a large number of factories and works.

THE PORJUS WATER POWER PLANT, on the Lule River, has been running ever since the end of 1914. This power station is the northernmost one in Europe (27 Eng. miles north of the Arctic circle), and supplies primarily the electric power for the Riksgräns Railway, which is chiefly used for the iron ore export from the vast ore fields and mines in Lapland, Northern Sweden, but it is also greatly drawn upon for power for the working of the aforesaid ore fields and mines. The plant is constructed for 50,000 H. P.

THE ÄLVKARLEBY WATER POWER PLANT, on the Dala River, about 85 Eng. miles north of Stockholm, is under construction for a production of 56,250 H. P., and will be ready for running and the delivery of power to a great number of factories and works, as well as a number of towns in the neighbourhood, in 1915.

THE SÖDERTÄLJE NAVIGATION CANAL connects Lake Mälar with the Baltic. It was opened for traffic in the year 1819, and has a navigable depth of 3,3 m. or 11 ft, but its reconstruction to a depth of 5,5 m. or 18 ft has been proposed.

THE ALFA-LAVAL SEPARATORS

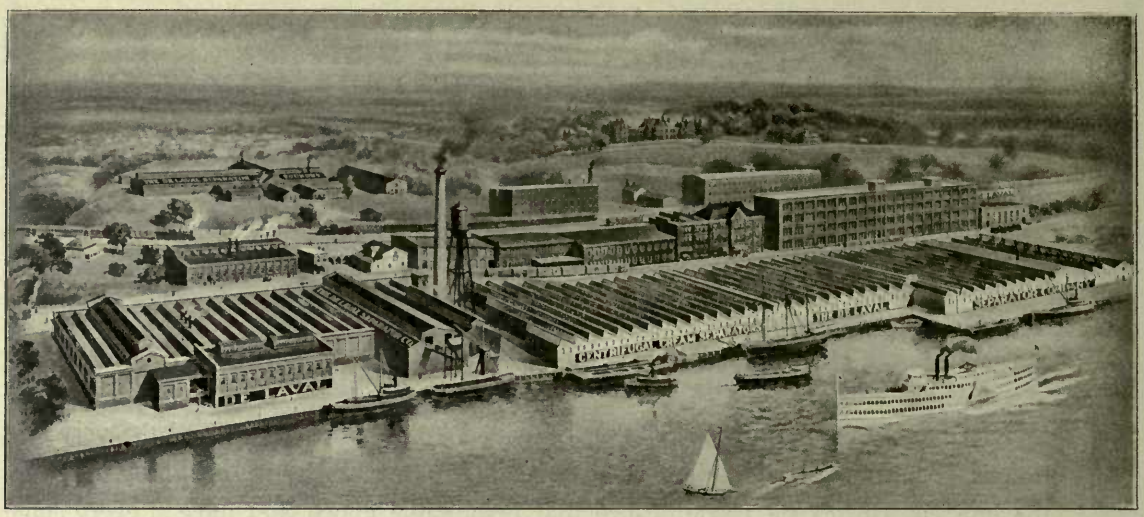
— THE WORLD'S STANDARD —

THE ALFA-LAVAL SEPARATORS — The World's Standard — and the very first practical centrifugal cream skimming machines, were invented 37 years ago by a Swede, the late Dr. Gustav de Laval. Since that remarkable epoch they have at every stage been the model of separator construction and to-day still hold the leading position. The effect achieved by these separators is that the entire dairy industry of the world has been completely revolutionised.

Dr. De Laval's epoch-making invention has been exploited by the Swedish Company »Aktiebolaget Separator» of Stockholm, which has for this purpose established workshops and agencies in various countries. Their manufacture is principally carried on at the Stockholm works and Poughkeepsie, the latter manufacturing the Alfa-Laval separators for the American trade under the name of DE LAVAL CREAM SEPARATORS, each of these works is larger than any other factory exclusively producing separators. Through the companies and agencies abroad the Alfa-Laval separators have found their way into every country where dairying is possible, and at all exhibitions where they have competed they have invariably obtained the highest awards, the number of which now exceeds 1,000.

The production and selling of 1,700,000 cream separators, which is the present sale figure, must naturally mean thorough experience. In the course of time thousands of inventions have been tested and tried from a scientific as well as a practical point of view, the best being adopted and applied to perfecting the Alfa-Laval Separator, and herein, as well as in the employment of all modern technical means in its manufacture, lies the secret of its success and superiority.

The size and importance of the works are illustrated by the fact that they are equipped to turn out annually upwards of 150,000 cream separators. A general idea of the world-wide activity and importance of the company will be gained by a glance at the two following pages of illustrations of the Company's establishments in different parts of the world together with the names of the respective companies and agencies.



AFRICA.

BRITISH EAST AFRICA.
CHILDS, PARR & JOSEPH, Mombasa.

ALGIERS.
SOCIÉTÉ DES ECRÉMEUSES ALFA-LAVAL, Paris.

UNION OF SOUTH AFRICA.
G. NORTH & SON, Durban.
VAN DER BYL & Co., Cape Town.
MANGOLD BROTHERS LTD., Port Elizabeth.

RHODESIA.
THE ANGLO-AFRICAN TRADING CO. LTD., Salisbury.

AMERICA.

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DE LAVAL DAIRY SUPPLY CO.:
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ARGENTINA.
GOLDKUHL & BROSTROM LDA, Buenos Aires.

CENTRAL AMERICA.
MIGUEL YÚDICE, San Salvador.

BRAZIL.
HOPKINS, CAUSER & HOPKINS, Rio de Janeiro.

PERU.
EMILO F. WAGNER, Lima.

CHILE.
MAURICIO GLEISNER & Co., Concepcion.

URUGUAY.
EUGENIO BARTH & CIA., Montevideo.

ASIA.

ASIA MINOR.
M. C. STAMATOPOULOS, Volo.

INDIA.
DAIRY SUPPLY CO. LTD., London.

JAPAN AND PACIFIC OCEAN ISLANDS.
THE DE LAVAL SEPARATOR, New York.

SIBERIA.
A.-G. ALFA-NOBEL, Omsk.

AUSTRALASIA.

NEW SOUTH WALES AND QUEENSLAND.
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EUROPE.

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AUSTRIA-HUNGARY.
A. G. ALFA SEPARATOR, Vienna.

DENMARK.
AKTIEBOLAGET SEPARATOR, Copenhagen.

GERMANY.
ALFA-LAVAL SEPARATOR, G. M. B. H., Berlin.

HOLLAND.
ALFA-LAVAL SEPARATOR, G. M. B. H., Berlin.

LUXEMBURG.
E. FLAMMANT, Luxemburg.

RUSSIA.
AKT. GES. ALFA-NOBEL, St. Petersburg, Warsaw, Odessa, Omsk.

BELGIUM.
SOCIÉTÉ DES ECRÉMEUSES ALFA-LAVAL, Brussels.

FINLAND.
P. SIDOROW, SUOM. K. O., Helsingfors.

GREAT BRITAIN AND IRELAND.
DAIRY SUPPLY CO., LTD, London, Edinburgh, Belfast, Cork, Limerick.

ICELAND.
AKTIEBOLAGET SEPARATOR, Copenhagen.

NORWAY.
AKTIESELSKABET F. ANKER, Kristiania.

SERVIA.
NICOLA FEHÉR & Co., Belgrade.

SWITZERLAND.
RUD. BAUMGARTNER & CIE, Zürich.

BULGARIA.
S. J. DATZOFF & SON, Sofia.

FRANCE.
SOCIÉTÉ DES ECRÉMEUSES ALFA-LAVAL, Paris.

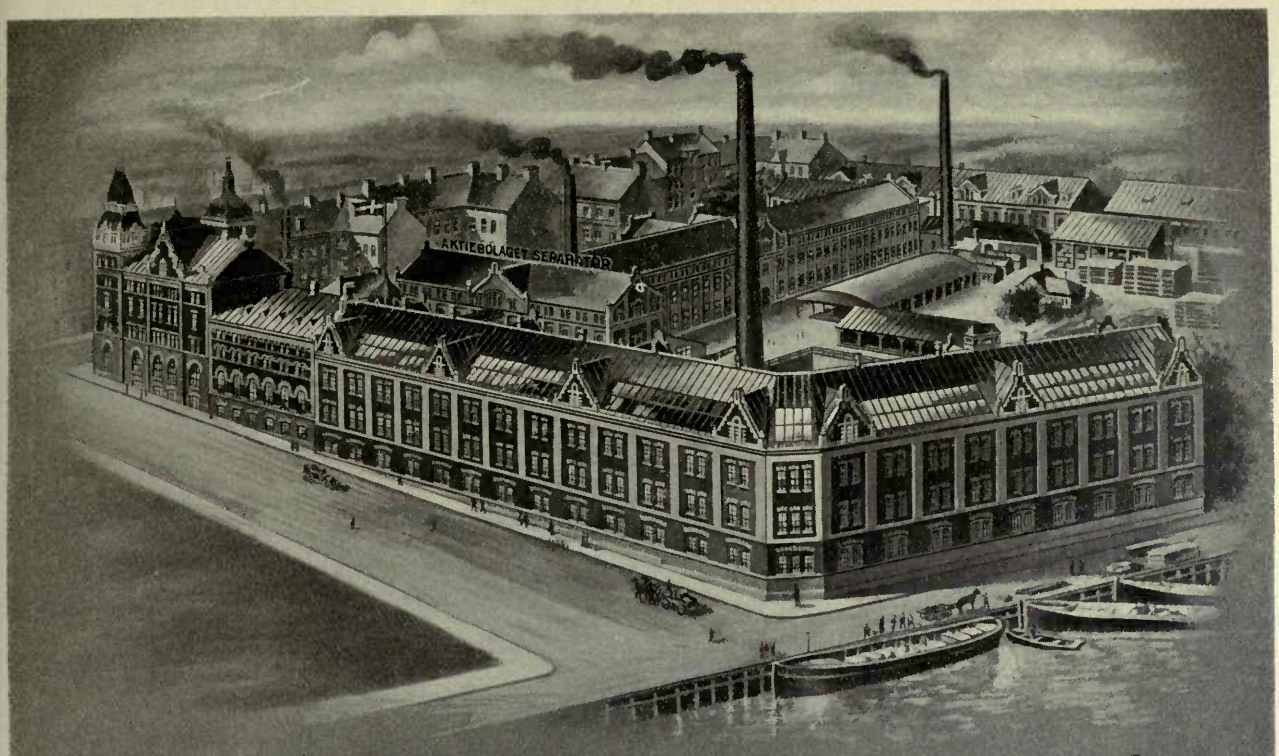
GREECE.
M. C. STAMATOPOULUS, Volo.

ITALY.
SOCIETA ALFA-LAVAL, Milan.

PORTUGAL.
HARKER, SUMNER & Co, Lisbon.

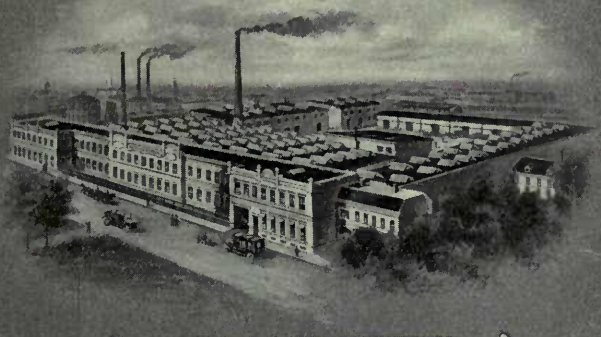
SPAIN.
EDMUNDO Y JOSÉ METZGER, Barcelona.

TURKEY.
JEAN & ARTHUR DORFANI, Constantinople.

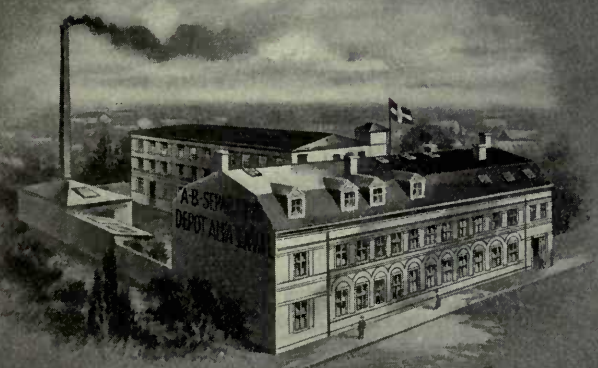


GENERAL EUROPEAN OFFICE AND WORKS OF THE DE LAVAL SEPARATOR COMPANY, STOCKHOLM, SWEDEN.

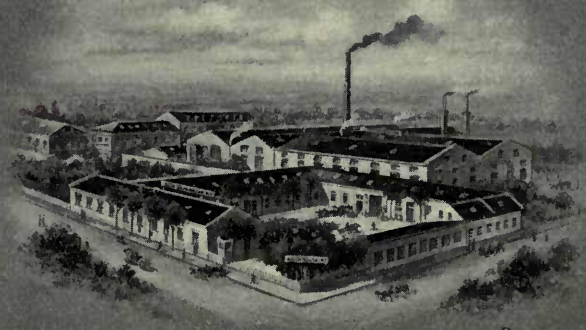
DE LAVAL SHOPS - HAMBURG, GERMANY.



DE LAVAL SHOPS - VIENNA, AUSTRIA.



DE LAVAL SHOPS - COPENHAGEN, DENMARK.

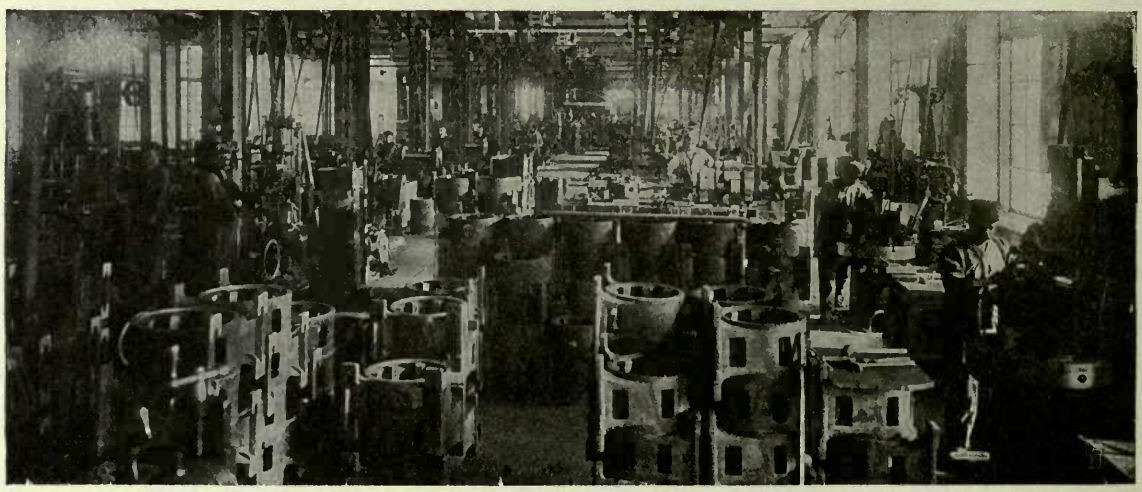


DE LAVAL SHOPS - BUDAPEST, HUNGARY.

ALLMÄNNA SVENSKA ELEKTRISKA AKTIEBOLAGET.

VÄSTERÅS SWEDEN.

THIS firm originated in the »Elektriska Aktiebolaget of Stockholm» which was organised as a stock Company in 1883 with a capital of 84,000 kronor. It was chiefly due to the epoch making inventions of Jonas Wenström that »Allmänna Svenska» has gradually succeeded from this very modest start, after making successive additions and extensions, in obtaining the leading position on the world's market which it now occupies after thirty year's continuous effort.

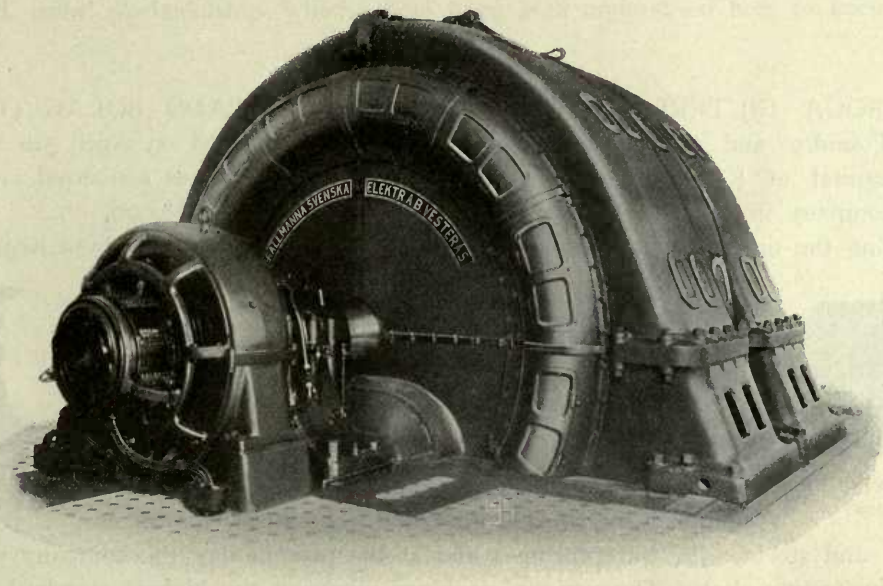


INTERIOR FROM MECHANICAL DEPARTMENT FOR SMALL MACHINERY.

By always making the superior quality of its manufacture paramount before every other consideration when designing each new type of machinery or apparatus, the Company has succeeded in making its productions well-known and recognised in Scandinavia as well as in the many countries to which it at present carries on a considerable export. This is equally true in regard to purely mechanical strength as well as the fulfilment of undertaken electrical guarantees.

ASEA is now manufacturing practically all kinds of material required in electrical engineering from switches, fuses, flat irons and small motors up to plants for several hundred thousand horse-power, electrical railroads and tramways, electric locomotives, cranes, elevators etc. Especially well-known in Europe as well as other parts of the world is ASEA's speciality of large alternating current generators in sizes up to 26,000 HP. per individual machine.

Of special interest is the considerable export of large generators which ASEA has carried on for many years. In this connection can be mentioned the Rjukanfors Power Station in Norway to which the Company furnished five alternating current generators of 16,800 Kva. each in 1911 and for which the Company is now building six generatos of 18,900 Kva. A large number of power stations in Canada, Cuba, Mexico and South America as well as England, Russia, Spain, Australia, Japan, South Africa and other countries have been equipped with generators from Allmänna Svenska.



ASEA 16,800 KVA., 250 R. P. M., 11,000 VOLT GENERATOR FOR RJUKANFOS.

The latest and most interesting additions to Allmänna Svenska's immense factory in Västerås are the new »Mimer» departments for the manufacture of small motors. A new building has also been completed recently as an extension to the old »Emaus» factory for the manufacture of large machines.

ASEA's sales are at present at the rate of approximately 18,000,000 kronor per year. The total floor area af all the shops now amounts to 61,185 square meters. One complete machine with an average rating of 42 HP. leaves ASEA's factories every fifteenth minute.

A S E A AND **ASEA**

TRADE MARKS

OFFICE IN LONDON:

THE ALLMANNA SVENSKA ELECTRIC CO. LTD,
Norfolk House, Cannon Street, E. C.

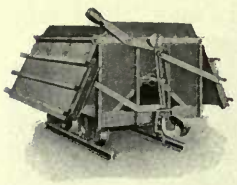
DEALER IN CANADA:

SWEDISH GENERAL ELECTRIC LTD.,
1011 Kent Building, Toronto.

AKTIEBOLAGET
ARBOGA MEK. VERKSTAD
(THE ARBOGA MECHANICAL WORKS LTD)
ARBOGA, SWEDEN.

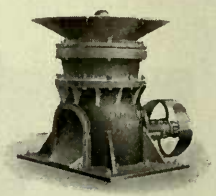
ARBOGA GJUTERI OCH MEKANISKA VERKSTADS BOLAG (The Arboga Foundry and Mechanical Works Co.) was established on April 5th 1856 with a capital of Kronor 150,000: —. When the business was converted into a limited liability company in 1888 the capital was increased to Kronor 468,000: —.

During the first few years the value of the annual production was about Kronor 150.000, but owing to the gradual increase the turnover now amounts to about one million kronor.



SELF EMPTYING ORE TRUCK.

During the past years the company has been awarded a great many diplomas and prizes at exhibitions at Paris, Madrid, Berlin, Copenhagen, Stockholm and Gothenburg.



GATE'S ORE-CRUSHER.

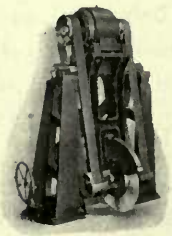
The business was first commenced with the manufacture of machines and apparatuses for mines and iron and steel-works, water-turbines and at the present day the company possesses its own turbine-testing shop. The various machines represent the highest standard of technical efficiency. The Company has made a speciality of *reliable and economical* turbine plants. Up to the present 1,600 turbine plants have left the works.

For Mines and Ore Concentration Plants the following machines are manufactured:
Ore Trucks, Crushers, Grinders, Separators, Screens, Hoisting apparatus.

The Company's patented three phase separator for low-magnetic iron-ores is superior to all other designs hitherto placed on the market.

For Smelting-houses, Iron and Steel-Works:
Blow-machines, Rolling-machines, Saws, Scissors, Presses, Furnaces etc.

For Iron Manufacturing Works:
Forging-machines for making axes, pick-axes and various other appliances. Complete outfits are made for factories with tools, hammers, furnaces etc.

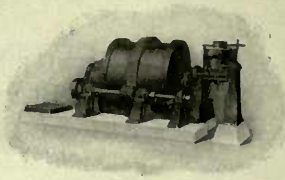


IRON AND STEEL SAW.

Complete outfits are also made for chain factories with all the machinery necessary for the production of chains from $^1/_2$" to $2^1/_2$".

Rivet and Nail Machines.

Special Roller Works etc.



BALL MILL.

The following comprise the remaining manufactures of the Company:

Chilled castings, among which is the well-known Arboga Chilled Wheel.

Cast and worked cog-wheels of which there are about 2,500 models.

Heavy castings and Cylinder Castings.

From the very commencement the firm succeeded in winning a name for their excellent designs and solid workmanship which they have well understood how to keep until the present day.

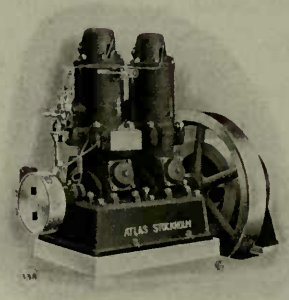
FORGING MACHINE.

NYA AKTIEBOLAGET ATLAS

STOCKHOLM, SWEDEN.

CRUDE OIL ENGINES

horizontal and vertical,
stationary and portable;
oil-motor-driven pumps.



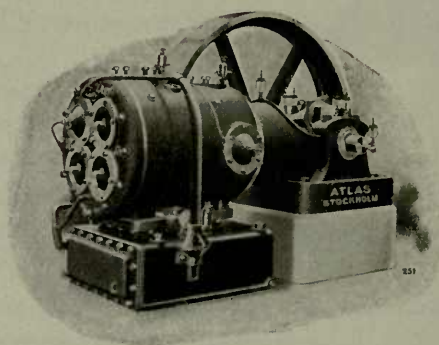
VERTICAL CRUDE OIL ENGINE.

AIR COMPRESSORS

stationary and portable.

ROCK DRILLS

for hard and soft rock,
with handle or with air feed.



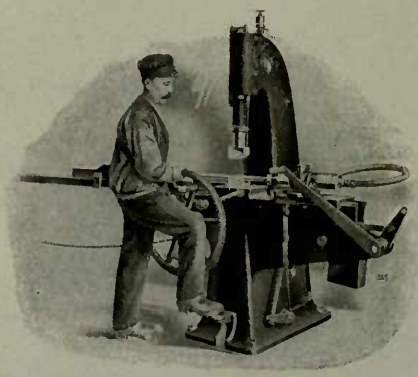
TWO-STAGE AIR COMPRESSOR.

DRILL STEEL SHARPENING MACHINES.

COMPRESSED AIR LOCOMOTIVES.

PNEUMATIC TOOLS

for riveting, chipping and caulking,
drilling, sand and concrete ramming etc.



DRILL STEEL SHARPENING MACHINE.

AKTIEBOLAGET
GERH. AREHNS
MEKANISKA VERKSTAD.

TELEGRAMS »GERHAM, STOCKHOLM». STOCKHOLM, SWEDEN.

MANUFACTURERS OF

MATCH-MAKING MACHINERY.

VEENER LATHES AND SPLINT CUTTING MACHINES.

INNER- AND OUTER-BOX MACHINES.

MACHINES FOR MAKING PASTE AND COMPOSITION.

PARAFFINING & DIPPING MACHINES.

BOX CLOSING & LABELLING MACHINES.

BOX FILLING MACHINES.

PACKETING MACHINES.

DRYING CUPBOARDS a. s. o.

SOLE PROPRIETORS OF

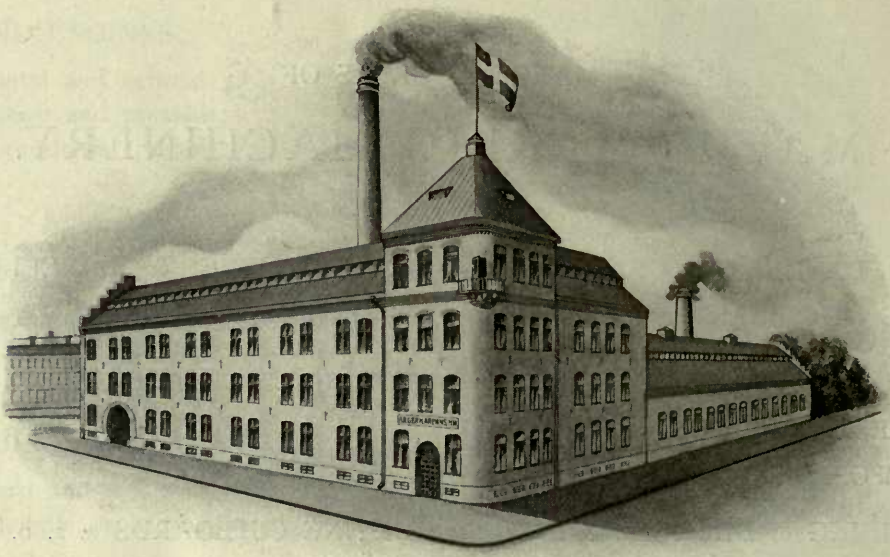
F. LUNDGREN'S PATENTS.

BEST RENOWNED ESTABLISHMENT FOR MATCH MAKING MACHINERY.

QUALITY AND CAPACITY UNEQUALLED.

AKTIEBOLAGET
GERH. AREHNS MEKANISKA VERKSTAD
STOCKHOLM
(GERH. AREHN'S MECHANICAL WORKS LTD)

SPECIALITY: MACHINES FOR THE MANUFACTURE OF MATCHES.



IT is well known that the Swedish match industry occupies a very prominent position, and Swedish matches enjoy a world-wide reputation. The machines used in this industry are the result of the inventive genius of Swedish engineers and are chiefly made in Sweden.

Oscar Arehn can with justice be called the pioneer of this work, especially in connection with the manufacturing of match boxes. As early as in the seventies he began to consider the possibility of making boxes by machinery. At that time Mr. Arehn was the managing director of »Nya Tändsticksfabriken i Stockholm» (The New Match Factory of Stockholm). It was during the time that he was in the employment of this firm that he endeavoured to put his views into practice, and in a small attic in the factory he erected and sat in motion the first machine for the manufacture of outside boxes which was invented by M. Wiberg, Phil. Doc. The result was certainly not very brilliant but in any case it proved that it was possible to manufacture boxes by machinery. The idea was there and the only thing that remained to be done was to realize it.

Mr. Arehn was very ably assisted by Mr. Fr. Lundgren, who, after having completed his technical studies, devoted himself to the work of invention. A small mechanical workshop

was built and various machines were experimented upon, among which were labelling machines and inner-box-machines. — Oscar Arehn died in 1885. His son, Gerh. Arehn, engineer, took up the work.

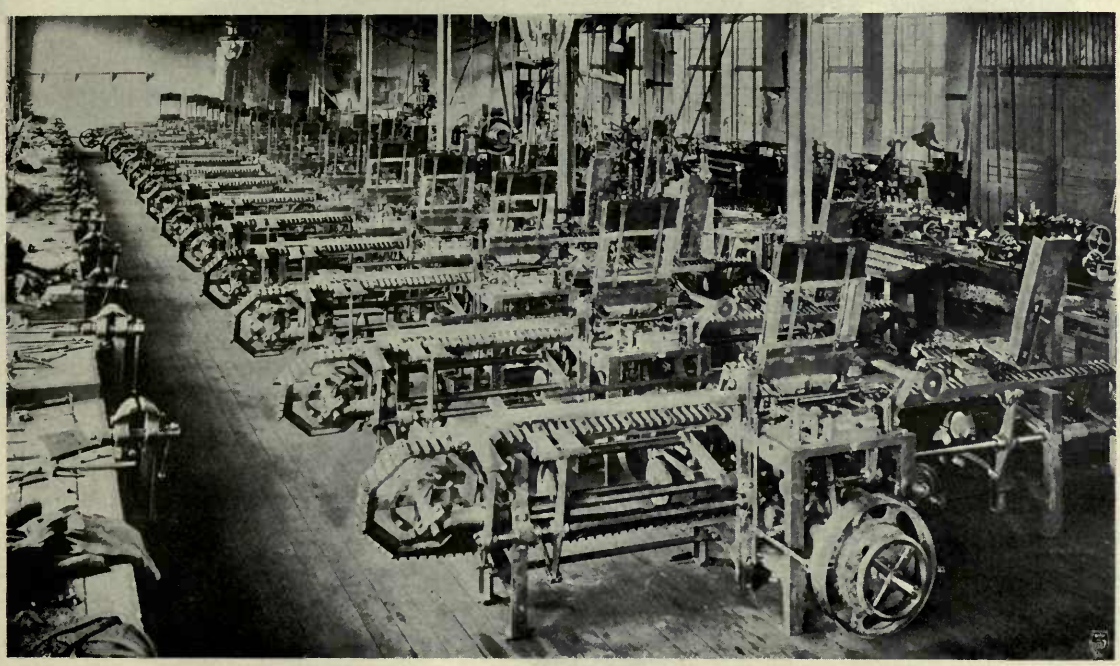
The box machines were by then so far perfected that they could be put on the market, and during the 10 years that the business was in the hands of Arehn & Lundgren a large number of machines were manufactured and sold.

In the year 1906 Gerh. Arehn retired from business and the firm was converted into a limited liability company. Mr. Lundgren was appointed technical leader and a new company obtained the sole rights to Lundgren's patent on box machines, filling-machines and packeting machines. — The new firm was called »A.-B. Gerh. Arehns Mekaniska Verkstad».

FRANS LUNDGREN.

After the company had taken over the business their first step was to obtain better and more commodious premises. A conveniently situated plot was bought from the City of Stockholm and upon it a modern factory building was erected according to plans by Mr. G. Lindgren.

The factory premises are fitted with modern machinery driven by electric power. The premises are lighted by electricity. — The manufacture under the new regime chiefly



ERECTING SHOP FOR QUADRUPLE FILLING MACHINES.

consisted of box machines. It has gradually increased till it now includes all machines and apparatuses necessary for the manufacture of matches.

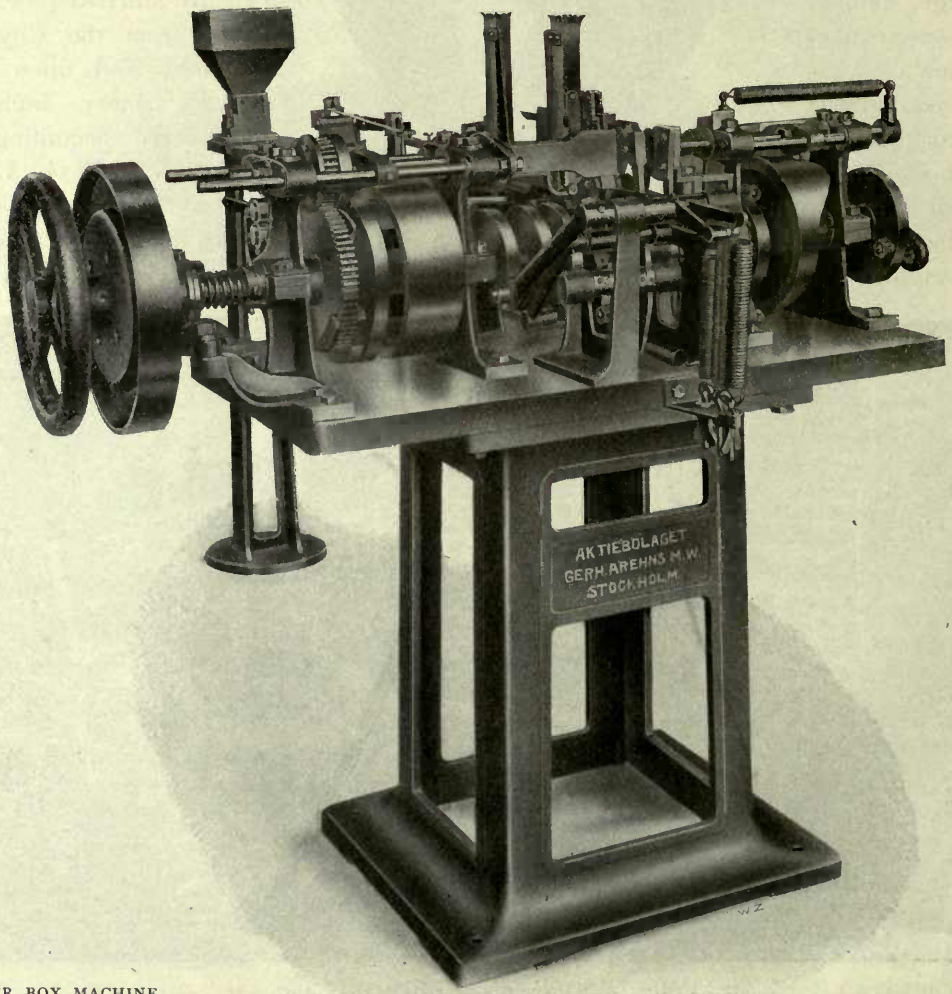
Improvements have also been added to the machines to increase their productive capabilities. The first box machines sold produced about 20,000 boxes per working day of 10 hours. The first box-filling machines did not manage more than from 15—20,000 boxes per day. The company's new quadruple filling machines fill 60,000 boxes per day. The same development is found in the packeting machines. The new packeting machine, using roll paper, packs and seals 160,000 boxes per day.

The machines are spread in all the industrial countries of the world.

That the export of machines is by no means inconsiderable is best shown by the fact that the works have delivered to only three large match factories abroad more than 1,000 machines representing a value of about $2^1/_2$ million Kr.

The company was represented at the exhibition at Stockholm of 1897 and at Paris in 1900, and in both cases the firm was awarded the gold medal.

The managing director is Mr. B. Grill.

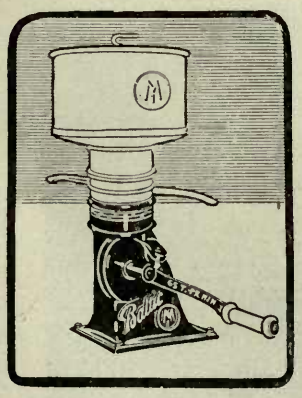


INNER BOX MACHINE.

AKTIEBOLAGET BALTIC

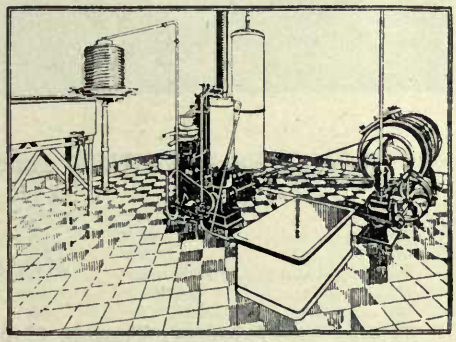
SÖDERTELJE — SWEDEN.

THE AKTIEBOLAGET BALTIC of Södertelje is one of the principal cream-separator factories in Sweden. Its makes comprise hand separators of many different sizes from small household separators with an hourly capacity of only 75 lbs. up to big hand separators skimming 1,350 lbs. an hour. The big types are also provided with a belt driving arrangement for steam or electric power. All »Baltic» separators are distinguished by excellent clean skimming and absolutely first class quality. The Aktiebolaget Baltic has not only gained a justified success by its hand separators but by the introduction of the so-called Baltic Turbine-Dairy Plants (patent Risberg) it has opened new ways for the development of dairying. These plants which consist of a steam boiler, a separator with a steam-turbine enclosed in its frame, a regenerative pasteuriser, milk pumps and a water-heater are characterised by simple and practical construction. Thanks to ingenious automatic arrangements only one person is required to manage the whole plant. The boiler's construction and the combination of the apparatuses ensure a fourfold utilisation of the steam and owing to this the plant has proved very economical. This is what brought a paying dairy industry with small quantities of milk within the region of possibility.



BALTIC HAND SEPARATOR.

The Baltic Vacuum Dairy Plant patent Risberg' is the latest novelty which this Company has introduced on the market, a novelty which may be called sensational as the inventor has succeeded in constructing a complete small dairy plant driven only by steam of no pressure that is produced by an ordinary feed cooker.



BALTIC TURBINE DAIRY.

The Aktiebolaget Baltic was established in 1908, its capital is 3,600,000 Swedish Kronor and its reserve funds amount to 1,525,000 Kronor. Branch offices at Christiania, Riga, Tscheljabinsk, Berlin and Sidney and thousands of agents represent the Company all over the world. In the United States the Company's interests are managed by the Empire Cream Separator Co., Bloomfield (N. J.) and in Canada by the Empire Cream Separator Co. of Canada Ltd., Toronto (Ont.). The majority of shares of these companies is owned by the Aktiebolaget Baltic, Södertelje.,

BERGVIK OCH ALA NYA AKTIEBOLAG

ADDRESS: SÖDERHAMN, SWEDEN.

TELEGRAPHIC ADDRESS: BERGVIK, SÖDERHAMN.

THE BERGVIK COMPANY LIMITED

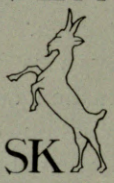
ADDRESS: 3, LAURENCE POUNTNEY HILL, LONDON E. C.

TELEGRAPHIC ADDRESS: »BERGVIK, LONDON».

STRONG SULPHITE WOOD PULP:

1st quality, mark S (black)

2nd quality, mark SII (green)



Inferior quality, mark SK (red)

Representatives for U. S. America:

MESSRS J. ANDERSEN & Co.

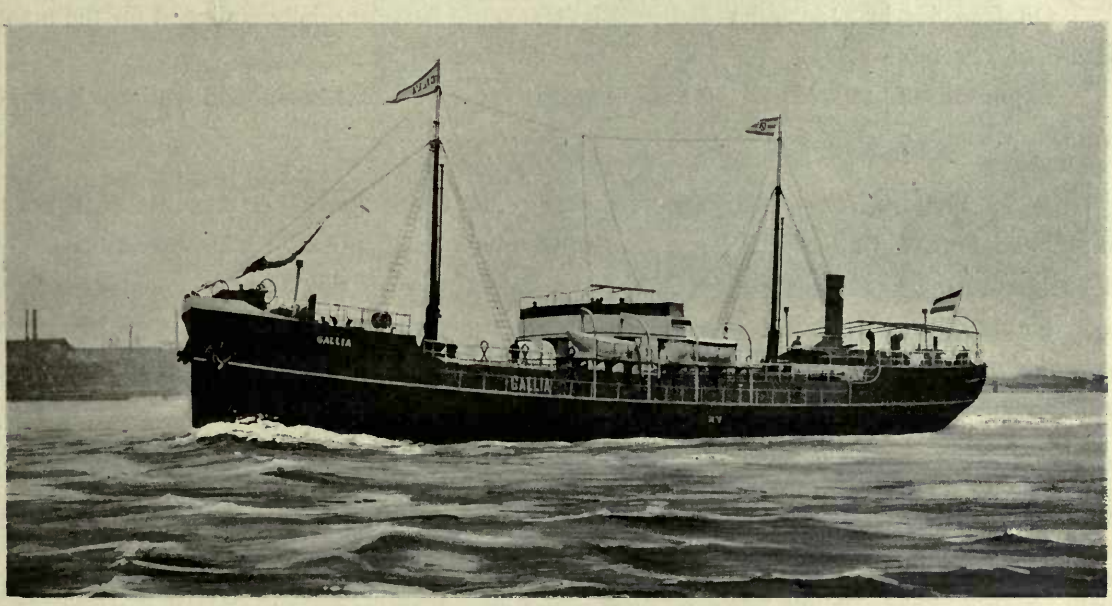
Address: Temple Court Building, Rooms 908—911, New York.

Telegraphic address: »REPUTATION, NEW YORK».

BOLINDERS

HEAVY CRUDE OIL MARINE ENGINES

SIMPLE ECONOMICAL RELIABLE



M. S. GALLIA.

A FEW OF THE LARGER BOLINDER INSTALLATIONS.

NAME	*B. H. P.*
"GALLIA"	640
Building	640
"AW KWANG"	480
"ISLEFORD"	320
"MOTOR I"	320
"ASIATIC"	240
"ATAIR"	240
"BOLINDER"	240
Building	240
IALINE"	240
Building	240
"IFE"	240
Building	240
"ILA"	240
"KASAI"	240
"KASM"	240
"LINZ"	240
"PHOCEEN"	240

NAME	*B. H. P.*
"KNAKKEGAARD"	240
"PIONEER"	240
"TUNG KWONG"	240
"UEBIGAU"	240
Building	160
"CAMERON"	160
"CAMOIN"	160
"CARA"	160
"FLEURITA"	160
"GEORGI LIONOSOFF"	160
"KAMORIN"	160
"MARIE L. HANLON"	160
"MIRI"	160
"MORTEN JENSEN"	160
Building	160
"FREDERIC"	160
"NIKOLAI"	160

NAME	*B. H. P.*
"SIR WILLIAM"	160
"SUD"	160
"WEST"	160
"GOODWIN"	160
"CARITA"	120
"EARLSHALL"	120
"ESPERANZA"	120
"JUKUIN MARU"	120
"KVIK"	120
"LEWES CASTLE"	120
"MAY BABY"	120
"OGARITA"	120
"QUARKEN"	120
"TURISTEN"	120
"KJOBENHAVNS FLYDEDOCK"	120
"TRONÆS"	120
"PSITSCH"	120
MOTOR LIGHTER	120

A.-B. AXEL CHRISTIERNSSON LTD.

— EXPORT — STOCKHOLM, SWEDEN — IMPORT —

TELEGRAPHIC ADDRESS: CHRISTIAN.

BRANCH OFFICES AT GOTHENBURG AND MALMÖ IN SWEDEN, AND MOSCOW IN RUSSIA.

FIRM WAS ESTABLISHED IN 1888

SPECIALISTS in Oils, Machines and Mechanical supplies. The largest importer in Sweden of oils. The largest stock in Scandinavia of oils and mechanical supplies. Oil factories in Stockholm and at Limhamn, the latter specially equipped for the manufacture of vegetable oils (linseed oil and rape oil) and oilcakes.

Exporters of *Paper* and *Wood Pulp, Wood Tar, Turpentine,* and various kinds of *Machinery*.

Paper and Wood Pulp. Sole Representative for RYDÖ BRUKS & FABRIKS A.B., RYDÖ BRUK, and HYLTE BRUKS A.B., HYLTE BRUK, which firms annually manufacture for export alone about 10,000 tons of Sulphite Pulp and 15,000 tons of Sulphite Paper, unglazed M. G. and double glazed (packing paper), also grease proof paper. The factories, which are represented in Stockholm by a special sale office, are fitted with the most modern machinery and the productions represent the last word in the Swedish paper industry.

Wood Tar and Turpentine. The firm has for many years exported large quantities of these commodities.

Machines and Tools. Wood working machinery is among the firm's export articles. As sole representatives for ASKERSUNDS MEK. VERKSTADS A.B. of Askersund, who are very well known for their manufacture of joinery machines, the firm is able to offer the best selection. In this connection *Saw Blades* of all kinds should receive special mention. *Foundry Machinery* of every description, made for the firm by A.B. EKSJÖ MEK. VERKSTAD of Eksjö, is also an important item on the export list. This manufacture is unique of its kind in Sweden, and has been proved to possess the best qualifications for export. All kinds of furnaces and machines used in a foundry are supplied.

Moreover, most of the Swedish export articles in connection with the machine branch may be advantageously obtained through the agency of the firm.

AKTIEBOLAGET DE LAVALS ÅNGTURBIN

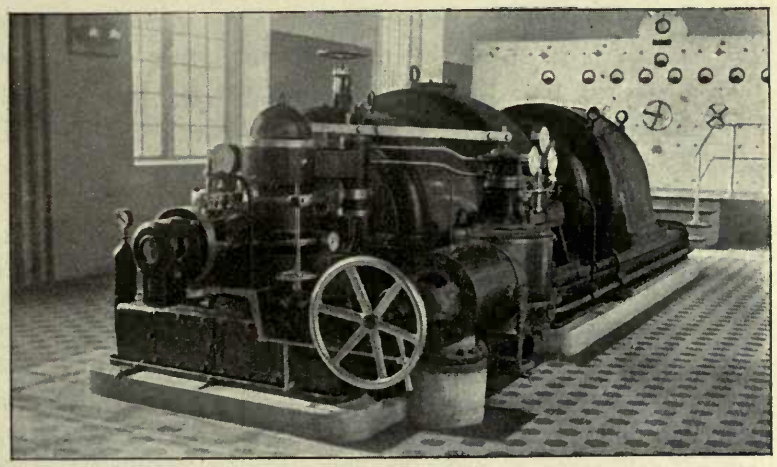
STOCKHOLM, SWEDEN.

(THE LAVAL STEAM TURBINE COMPANY LIMITED)

STOCKHOLM, SWEDEN.

AS early as 1883 Dr. GUSTAF DE LAVAL invented as mall reaction steam turbine especially designed for driving milk separators.

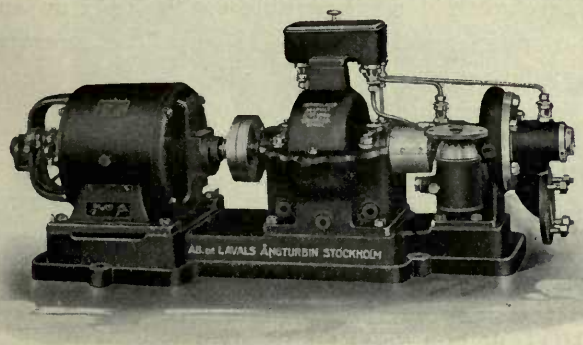
In 1889 Dr. de Laval designed a new turbine, the famous Laval impulse turbine. The chief characteristics of this turbine are that the steam expands completely in nozzles and that the kinetic energy of the steam is transformed into work by means of a fast running turbine wheel with one or two velocity stages. In order to put the high speed of the steam to full economic advantage the turbine wheel must run very fast from 10,000 to 30,000 revs. per minute. At such high speeds a rigid shaft cannot be used, but the problem was solved by Dr. de Laval's ingenious invention of the flexible shaft. This turbine appeared on the market in 1891. In 1893 the Company »Aktiebolaget de Lavals Ångturbin» was founded with a capital of 1,200,000 Swedish crowns, which later was increased to 1,600,000 Swedish crowns.



2000 KW. STEAM TURBINE GENERATOR, SYSTEM LAVAL MULTIPLE, DELIVERED TO PORT KUNDA CEMENT WORKS, RUSSIA.

The original Laval turbines are manufactured from 1,5 to 500 H. P. and have been sold all over the world. There are far more Laval turbines running than of any other system of steam turbines.

As the demand for larger units increased more and more, the company started in 1907 the manufacture of big multistage turbines for condensing, counter pressure and extracting purposes. These turbines, manufactured in units upwards of 15,000 H. P., form a necessary complement to the original Laval turbines. About 1898 the company took up the manufacture of Centrifugal pumps of their own design. These pumps are characterized by very solid construction and an unusually high standard of efficiency. During recent years the company has commenced to manufacture ventilators, air compressors, surface condensing plants and 3-phase turbo generators.



7 H. P. LAVAL STEAM TURBINE DYNAMO.

The Works are situated at Järla, near Stockholm. These Works have lately been considerably enlarged in order to meet the continually increasing demand for steam turbine machinery.

In 1901 a daughter Company »the Laval Steam Turbine Company, Trenton, N. J.» was founded in U. S. A.

AKTIEBOLAGET INGENIÖRSFIRMA FRITZ EGNELL

STOCKHOLM, SWEDEN

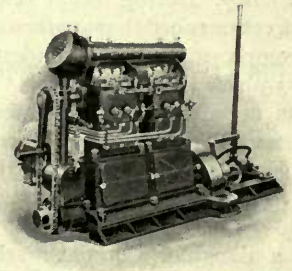
STOCKHOLM I • TELEGRAPHIC ADDRESS: MOTOR.

AMONG the various interests and very comprehensive work of this company is a control apparatus named »Mono» which has been put on the market with very great success, as also a system based upon the apparatus in question, known as »The Mono System».

All who have been brought into connection with industry which in one form or another needs steam know what tremendous efforts and economical sacrifices have been made in order to reduce the consumption of fuel as far as possible, and thereby lower expenses. In these modern days with their acute competition industrial leaders are compelled to make a an effort to exercise economy. However perfect apparatuses and machines may be they do not serve their object if they are not properly and carefully attended to, and consequently no pains have been spared to provide an effective control of the management. Fuel consumption controllers of one kind or another have consequently sprung up like mushrooms. These apparatuses are intended to control the work of the fire-men and have already come into extensive use, especially at plants that are under a control system introduced by engineers. These apparatuses, however, are very sensitive, and under certain conditions unreliable so that even they need very careful management if they are to do their work in a satisfactory manner.

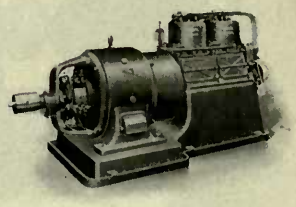
The »Mono» is such an apparatus which has been constructed with a view to the introduction of certain new improvements.

It has been proved that the consumption of coal is in proportion with the percentage of carbonic acid gas in the smoke gases, and therefore it is possible by controlling that the proper percentage of carbonic acid gas is maintained also to control that the least possible amount of fuel is consumed. Therefore if it were possible to construct an apparatus that would be reliable under all conditions and that needed very little supervision it would not only be possible to exercise control in this respect but it would enable the establishment of a system of compensation based upon the control, which would encourage the fire-men to manage their work in the very best way. The »Mono» has endeavoured to fulfil

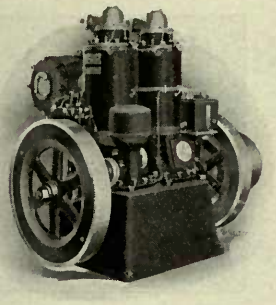


PENTA MARINE MOTOR
15 H. P.

THE PENTA MOTOR FOR PETROL, ALCOHOL AND PARAFFINE.

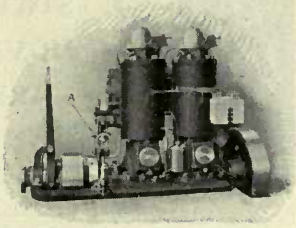


PENTA MOTOR-DYNAMO
10 VOLTS — 12 AMPÈRES — 2,5 H. P.



STATIONARY HEXA MOTOR
40 H. P.

THE HEXA MOTOR FOR HEAVY CRUDE OILS.



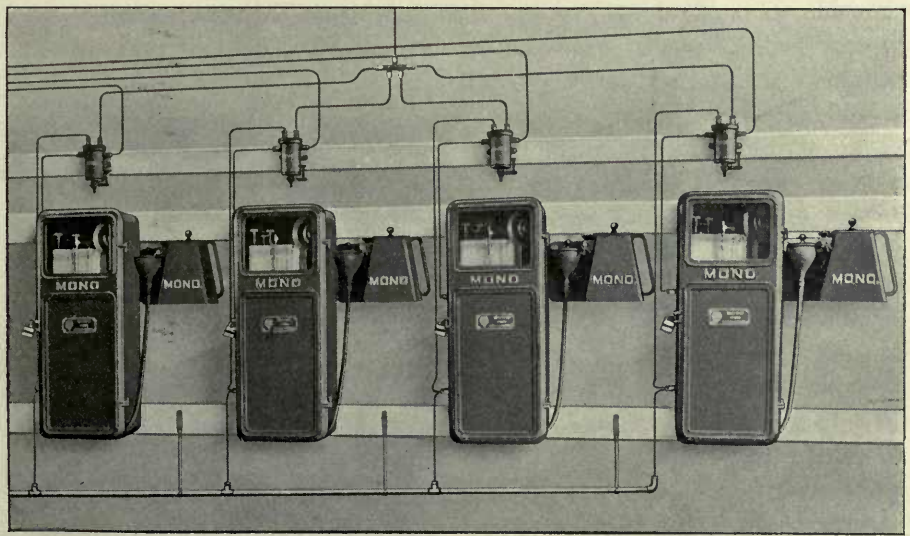
HEXA MARINE MOTOR
40 H. P.

these objects and the practical results obtained seem to prove that it has been eminently successful.

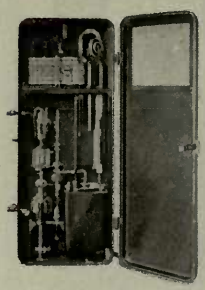
The »Mono» is so constructed that under all conditions it gives an exact result. Should circumstances arise to hinder its action it stops but does not give inaccurate results. The »Mono» requires the least possible attendance. For instance the diagram which runs for one or two months does not need to have its pen filled more than once each fortnight, nor need the absorption liquid be changed more than once during the same period. Other apparatuses require very careful daily management, whereas the »Mono» can go weeks with but very little attendance.

The principles of the Mono system are as follows:

To ensure the strictest economy in a given plant it is known that the percentage of carbonic acid gas must be kept within certain bounds, say for instance 10—12 %. Now it is impossible for the fire-man to keep the percentage of carbonic acid gas so constant at any plant, but certain variations occur which are more or less dependent upon the working conditions, load variations etc. If the fire-man keeps the percentage of carbonic acid gas within the requested limits he is considered to work with an effect of 100. But for the above-mentioned reasons the highest obtainable effect will be less, and therefore at an electric works for instance it would be about 80, at a brewery about 60 etc. A certain price is determined depending upon the size of the plant and its consumption of coal which the



MONO INSTALLATION AT STOCKHOLMS BENMJÖLSFABRIK, SANDVIK, WHERE THE SYSTEM HAS BEEN IN USE SINCE APRIL 1913. 4 MONO-APPARATUSES.



MONO CO_2 RECORDER.

STATIONARY MONO for Stationary Power Plants.
MOVABLE MONO for Occasional Tests.
MARINE-MONO for Steam Ships.

The Best and Simplest CO_2-Recorder in the World.

fire-man receives if he can realize the fixed maximum effect. He does not, however, work with such a high effect but instead the percentage of carbonic acid gas varies still more. The bonns is then calculated in such a way that the fire-man receives it for the time that he is able to keep the percentage of carbonic acid gas within the limits of 10—12 %. He gets no bonns if the percentage of carbonic acid gas is between 12—14 or 8—10 %, and finally his pay is reduced in proportion with the time that the percentage of carbonic acid gas exceeds 14 % or is less that 8 %. By means of a specially constructed mono scale the calculation of the fire-man effect is very easily done from the mono diagram. See pamphlet »Marina-Mono» for a further description of the »Mono» system.

The system has been introduced in a great many industrial establisments and still increases its popularity, and in practice it has proved itself able to fulfill its objects, namely, to make the fire-men interested in their work and thereby to profit factory owners by means of saving fuel.

References: THE SWEDISH ROYAL NAVY, STEAM BOILER ASSOCIATION and others.

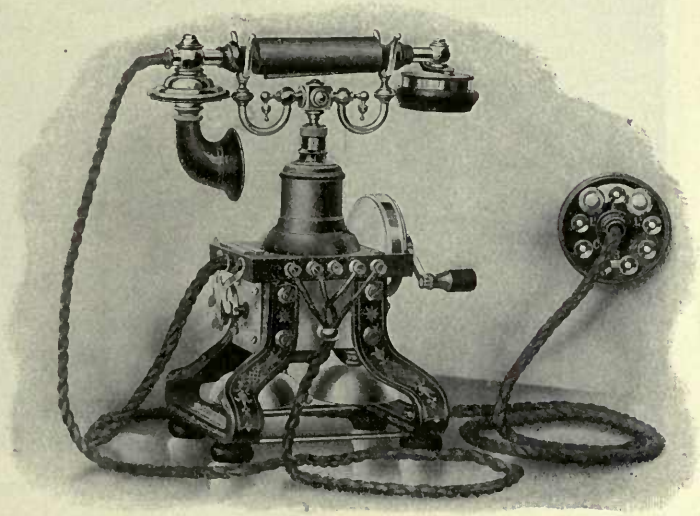
AKTIEBOLAGET L. M. ERICSSON & CO.

(L. M. ERICSSON & CO. LTD.)

STOCKHOLM, SWEDEN.

THE Swedish telephone industry may at present be regarded as one of the most important of Sweden's export industries.

Certainly no one dreamed that such would be the case when L. M. Ericsson, at the close of the seventies, commenced his experiments upon the telephone which had recently been invented in America. In his small and modest mechanical workshop he soon proved successful in manufacturing good telephones. That was the simple beginning of L. M. Ericsson & Co. Ltd. which is to-day famous all over the world. L. M. Ericsson's manufacture of telephones was at the beginning conducted on a very small scale, and the making of complete telephone apparatuses did not begin in earnest before 1881. Then it was that the ice was broken, for since that date the firm has enjoyed ever increasing prosperity and has been received throughout the world in a spirit of continually growing confidence.



MAGNETO TABLE TELEPHONE SET.

In the beginning of the nineties the Company began to devote their attention to the export trade; and the first countries to come under its influence were the neighbouring countries Finland, Norway, Denmark and Russia. It was not long, however, before other countries both in Europe and elsewhere soon became the Company's customers.

At the present time there are but few countries to which the Ericsson apparatuses *do not* find their way.

Nowadays the Ericsson telephones are to be found in Persia and Corea, in Punta Arenas, in the Straits of Magellan, in New Caledonia, on the Faroe Islands, the Fiji Islands and the Bermudas.

C. B. TABLE TELEPHONE SET.

At the present time more than 85 % of the entire manufacture made by the Stockholm factory is exported.

This wonderful progress has compelled the firm to increase their capital time after time. In 1896 the business was converted into a limited liability company with a capital of 1,000,000 Kr. Five years later, in 1901 another Swedish telephone company named "Aktiebolaget Telefonfabriken" became amalgamated with the Ericsson company, when the share capital was increased to 3,400,000 Kr. During the years 1909 and 1913 the share capital was doubled so that at the present time it amounts to 13,600,000 Kr.

When the company's interests became more and more international in character it was considered advantageous to carry on a part of the manufacture abroad. Therefore branch factories soon appeared in quick succession. The company possesses the following branch companies:

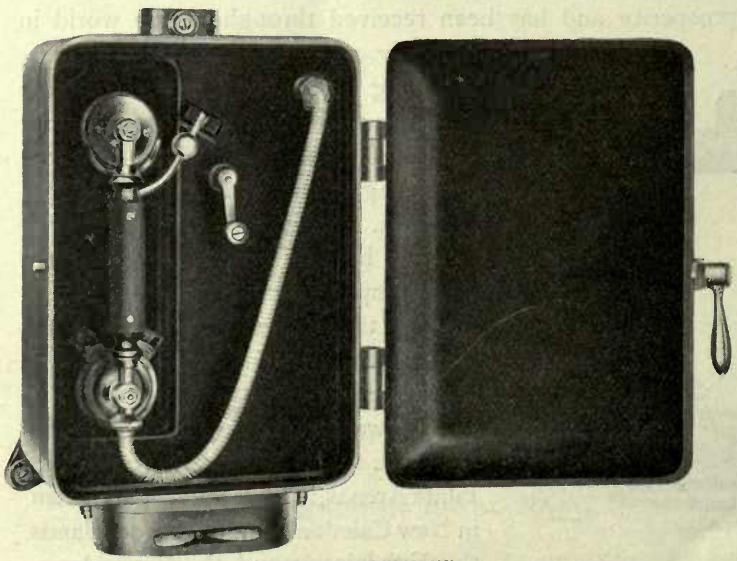
SECRET INTERCOMMUNICATION TELEPHONE FOR 50 LINES.

IN RUSSIA.

Russische Actiengesellschaft L. M. Ericson & Co., Petrograd. This company was founded in 1897 and converted into a Russian limited liability company in 1905.

IN ENGLAND.

The British L. M. Ericsson Mfg. Co. Ltd. with an office in London and the factory at Beeston, Notts. This business was founded in 1903 but the mother factory has had a branch office in London ever since 1898.



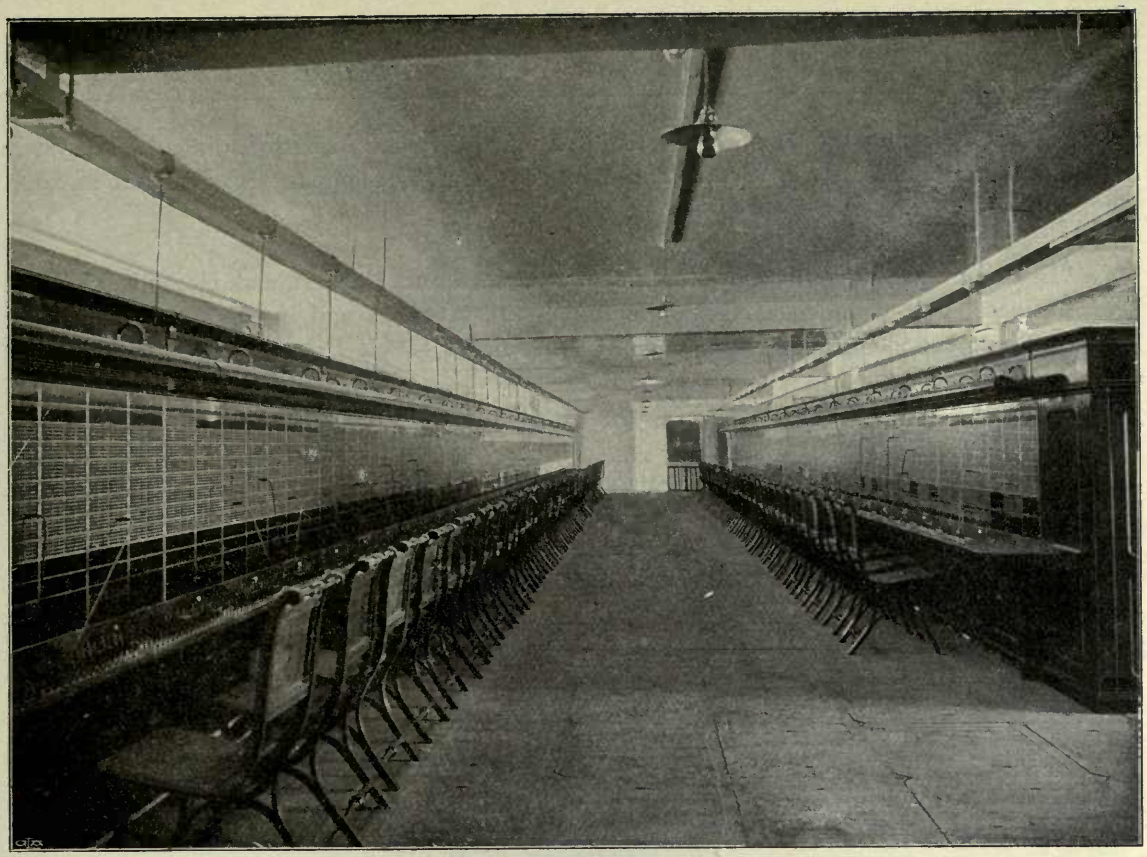
MINE TELEPHONE.

IN THE UNITED STATES OF AMERICA.

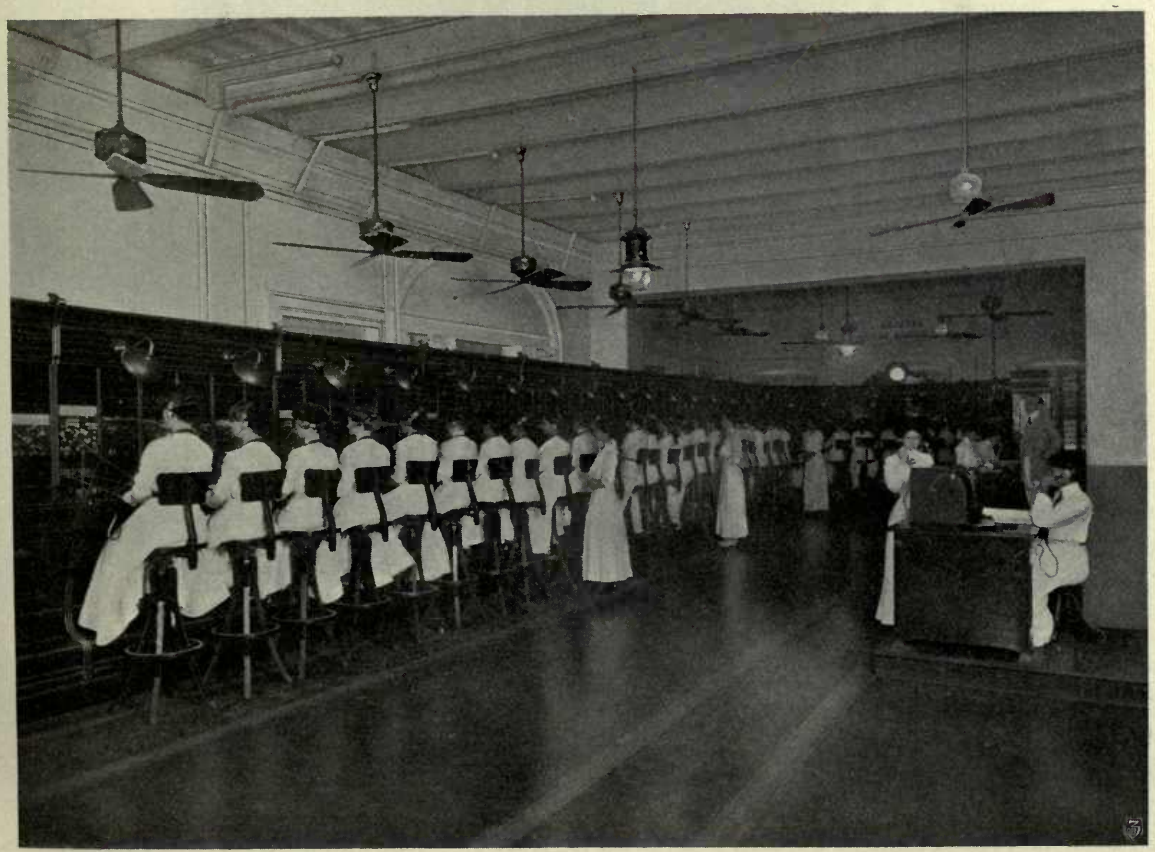
Ericsson Mfg. Co., Buffalo, N. Y. This factory was established in 1905 but the mother factory had had a branch office in New York three years previously.

IN MEXICO.

Empresa de Teléfonos Ericsson S. A. This is a trading company and has no factory. It pos-



THE PARIS TELEPHONE EXCHANGE.



THE CALCUTTA TELEPHONE EXCHANGE.

sesses a concession for the telephone system in Mexico City and its surroundings. The system has 10,000 subscribers. It was commenced in 1905 and the company was formed in 1909.

IN AUSTRIA.

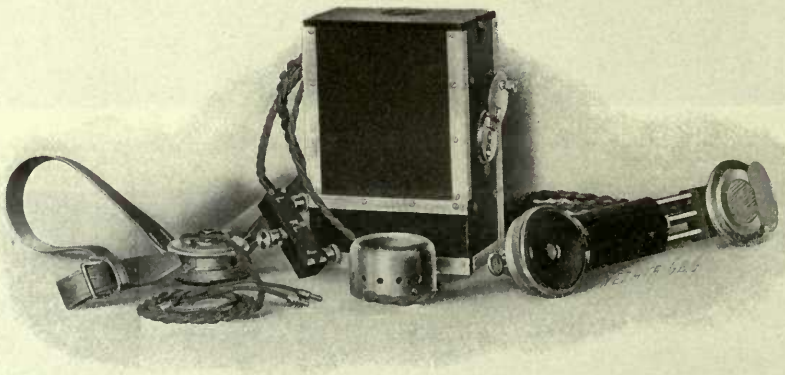
"Ericsson" Oesterreichische Elektricitäts A.-G. vorm. Deckert und Homolka, Vienna. The business was founded at the beginning of the seventies and in 1911 was taken over by the afore-mentioned company, in which Aktiebolaget L. M. Ericsson & Co. are the chief share holders.

IN HUNGARY.

"Ericsson" Ungarische Elektricitäts A.-G. vorm. Deckert und Homolka, Budapest. This company is similar to that in Austria.

IN FRANCE.

Société des Téléphones Ericsson, Paris. Founded in 1911 and started its own factory in 1913.



PORTABLE TELEPHONE SET.

ESKILSTUNA STÅLPRESSNINGS AKTIEBOLAG

ESKILSTUNA, SWEDEN.

ESTABLISHED 1893.

POSTAL AND TELEGRAPHIC ADDRESS: »PRESSBOLAGET, ESKILSTUNA».

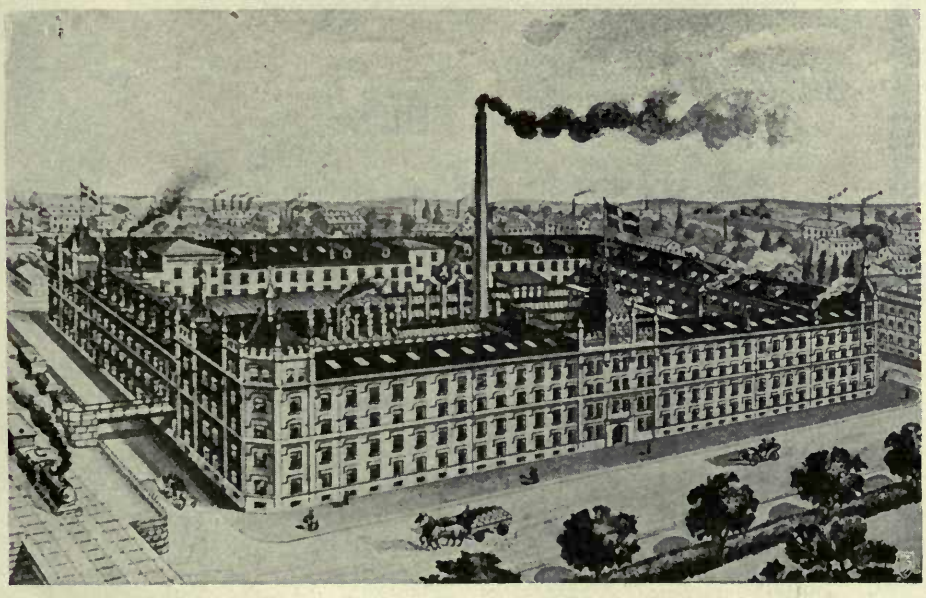
TRADE MARK

STAMPING WORK — ENAMELLING WORK — PLATE ROLLING WORK.

MANUFACTURES: One piece Milk cans and Dairy Utensils. Enamelled Hollow-ware. Ulax- and Alfa Strainers. Pressings for Separators. Casings for Torpedoes and Mines. Whole-pressed Closet Basins. Thin plate for Deep Stamping and Dynamo Plate.

A great part of the manufactures of this factory is sold for Export. Its shells for torpedoes and mines have been supplied to the Navies of most countries. Its milk cans and enamelled hollow-ware have found a ready market all over the world.

Production	1894:	Swedish	Crowns.....	62,000: —
»	1904:	»	»	960,000: —
»	1913:	»	»	3,435,000: —



AKTIEBOLAGET
FÖRENADE SVENSKA TÄNDSTICKSFABRIKER

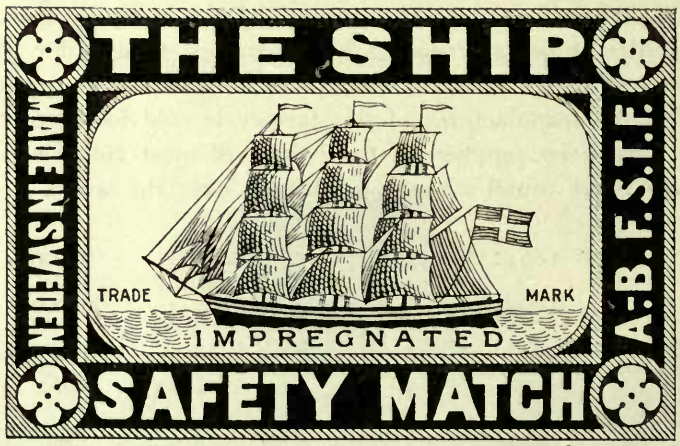
(THE UNITED SWEDISH MATCH FACTORIES, LTD)

TELEGRAMS: »UNITED».

HEAD OFFICE: STOCKHOLM, SWEDEN.

Match Factories at KALMAR, MÖNSTERÅS, GOTHENBURG, MALMÖ, LIDKÖPING, HVETLANDA, FREDRIKSDAHL, VEXIÖ, VESTERVIK, NYBRO and LOVERS.

»THE SHIP»
IS
THE
BEST
SAFETY
MATCH.



Specially impregnated.

Will not glow when extinguished.

Contains no dangerous chemicals and leaves no noxious fumes.

Always Ask for

THE SHIP

STANDARD SIZES (in Millimètres):
approximate measurements.

Nos.	Sizes.	Lengths:		Breadths:		Depths:
1.	Full	59	×	37,5	×	18
2.	Reduced Full	»	×	»	×	12
3.	Increased Full	»	×	»	×	24,5
4.	Three-quarter	53	×	»	×	16
5.	Do. Reduced	»	×	»	×	13
6.	Do. Increased	»	×	»	×	23
7.	Half	»	×	31	×	15
8.	Quarter	43	×	27,5	×	13,5
9.	Square	53	×	46,5	×	19

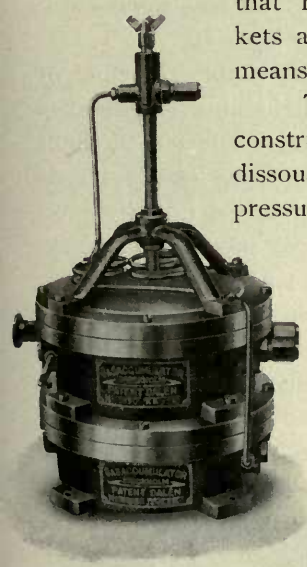
SVENSKA A.-B. GASACCUMULATOR

(GAS ACCUMULATOR CO. LTD., SWEDEN)

STOCKHOLM

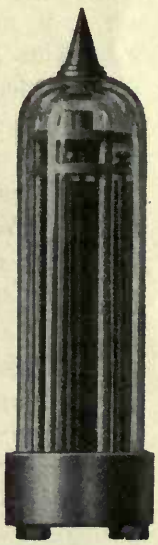
AMONG the industrial enterprises which have been started in Sweden during the last decade a leading place has been taken by the Gas Accumulator Co. Ltd., Sweden, (Svenska A.-B. Gasaccumulator), which has launched the ingenious inventions in acetylene illumination of Gustaf Dalén, the well-known engineer.

The history of the development of the Company is at the same time the history of pioneering Swedish inventive achievement that has altained for the inventor a lasting fame, that has introduced the company's manufactures into the most distant markets and that has likewise provided mankind with new effective means of assuring intercommunication both on land and at sea.



AGA-FLASHER

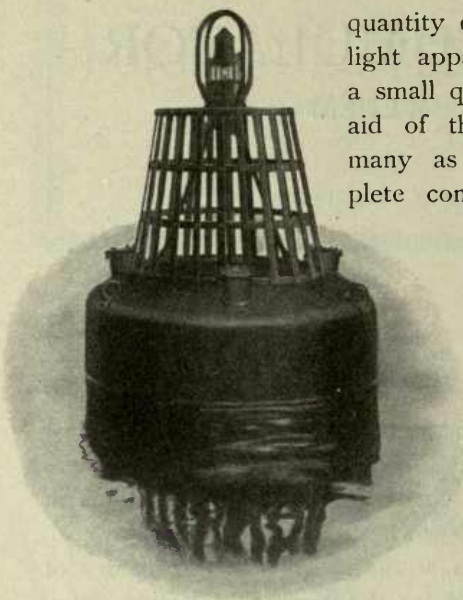
The AGA-system, as a general descriptive title for Dalén's constructions, uses acetylene gas in the form of "acétylène dissous" i. e. acetylene dissolved in acetone and kept under a pressure of 10 atm. in steel cylinders (gas accumulators) filled with a porous mass, which depresses the gas bearing solution through extremely small pores, thereby obviating the possibility of explosion. This method of preserving and transporting acetylene, the invention of the Frenchmen Claude and Hess in 1896, has been very much improved by Dalén. He obtained, as a result of successful experiments, a perfectly stable filling, proof against jolting and shaking. Acetylene gas preserved in this manner has been scientifically proved to be, beyond doubt, absolutely free from danger.



AGA-SUNVALVE

After having thus overcome the intricate difficulties in managing this, the most powerful of all known gas illuminants, Dalén discovered means of applying it to *automatic illumination of light-houses,* that in a short time effected a revolution in this connection. There are two of Dalén's inventions which are particularly epoch making, namely, the flash-light apparatus and the sunvalve.

The AGA flash-light apparatus or flasher, constructed in the autumn of 1905, is intended to produce flashes of short duration, partly, so as to save gas, partly, through varying the number of and intervals between the flashes, to give the light from a certain light-house a totally different character to that of others. A sensible membrane, acting under the gas pressure, causes by means of a magnetized lever the action of a valve that regulates the



AGA-LIGHT-BUOY (LA PLATA)

quantity of gas flowing into the burner. The firm manufactures flash-light apparatuses in standard type which, even when they use such a small quantity of gas as 0,5 liter an hour, can, however, with the aid of this small quantity, cause the valve to open and close as many as 3600 times per hour; and, as an illustration of the complete construction of the mechanism of the flash-light, it may be mentioned that, with one liter of gas, more than 10,000 flashes can be obtained. By experience it has been found that, for flash-lights, flashes of down to 0,3 seconds duration are quite sufficient from a nautical technical point of view. For instance, a so-called 1-flash-light, adjusted to 0,3 seconds light and 2,7 seconds subsequent darkness, i. e. one flash every third second, only consumes gas during one tenth of the whole period. Such a flash-light apparatus shows a saving in gas of 90 % and admits of every desired combination as regards character of lighting periods. Owing to the fact of the real motive power of the flash-light apparatus being the gas pressure in the tank, it works quite automatically so long as the supply of gas lasts.

The AGA sunvalve which was invented in 1907 is based on the simple principle of physics that absorbed light is converted into heat, for which reason light absorbing bodies on being illuminated undergo an extension. The parts of the sunvalve affected by light are made of four homogenous rods of the same metal. The surface of one of these rods is blackened and, consequently, is light absorbing, the others are polished i. e. light reflecting. When, at the break of day, the apparatus is affected by the sunrays the blackened rod expands more than the polished ones. The difference in length between these rods need only be about 0,0015 mm. (0,00006″) to cause the apparatus to act. This practically immeasurable movement is, however, sufficient to close the sunvalve by means of an ingenious multiplying gearing which, by the way, must be manufactured with the utmost mechanical exactness.

Even when daylight is diffused (when the sky is cloudy) the necessary difference in the length of the rods is effected. It will thus be seen that the sunvalve can be so adjusted as to give it an unheard of degree of sensitiveness for the slightest variation in the density of the light.

AGA-LIGHT-SHIP (SWEDEN)

AGA-LIGHT-SHIP (RUSSIA)

The sunvalve is coupled to the gas conduct between the accumulator and the flasher, and when it closes on account of an increase of daylight, the light becomes extinguished, only leaving a very small pilot-flame. Towards the evening when the daylight fades, the

black rod contracts till it becomes equal in length with the others, the valve opens and the light is at once automatically lit.

In Swedish waterways the sunvalve saves 35—40 % and, by combining it with the flash-light apparatus, even up to *94 %* of the quantity of gas which would have been consumed had the light-house light been burning continually. The same gas tank which, formerly, had to be changed every third week lasts, with the AGA-system, a whole year.

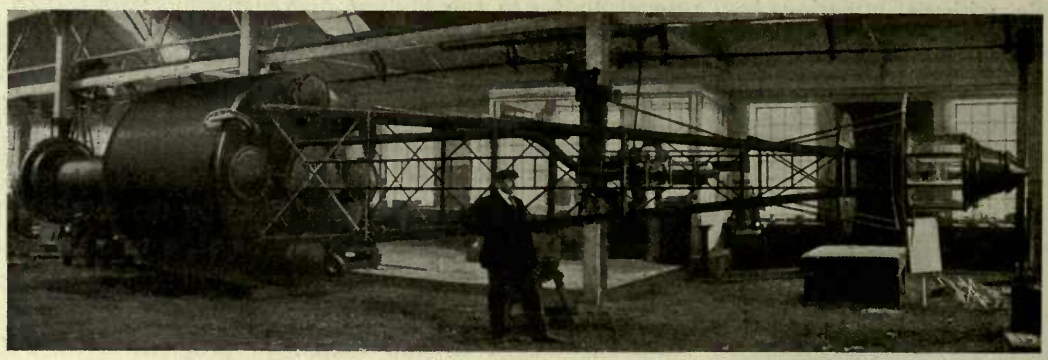
The possibility which is thus opened of leaving the light-house light during long periods without attention has proved to be in the highest degree practical, owing to the reliability of the apparatus which has been proved by severe tests. As economy and easy management are prominent features, the light-house authorities of all sea-faring nations have hastened to utilize the AGA-system for illuminating light-ships, light-buoys and fixed lights of all different types and sizes. The lead has been taken by the Swedish Pilot Service which employs the AGA-system to a very great extent for lighting the water-courses, difficult to navigate, round the rocky coasts of Sweden. To enumerate all the different stages of the march of progress of the AGA-system in the markets of the world would occnpy too much space. It will suffice here to mention that the AGA-lights illuminate the inhospitable shores of Alaska, the difficult courses of the Straits of Magellan, the coasts of Japan, and in the near future, the new Panama Canal, whose lighting is entirely undertaken by the Company. Where, formerly, obstacles presented by nature made it inconceivable to establish light-house illumination without enormous expense and impossible demands on human powers of endurance, there the simple automatic AGA-apparatuses have rendered it possible for the authorities to provide seamen with well-lighted courses; and, again, in other places, where the question of cost alone entirely prevented the presence of light-houses, the AGA-system has enabled the requirements of shipping to be fulfilled. To illustrate the economic importance of Daléns inventions, reference is here made to only one example, viz.: that the annual cost of a light-house at the mouth of the Delaware river in U. S. A., before being converted into an AGA-light-house, amounted to 1640 dollars, but after the change to 12,25 dollars. The combination of light and sub-marine sound signals, especially on buoys recently placed on the market by the company, has further rendered it still easier to replace such lights with AGA-apparatuses. The AGA-flash-light has not only been extensively adopted for the illuminating of light-houses. It has for some years been successfully adapted for railway signals, in which its characteristic advantage of making signal lights distinguishable by means of »flashes», gives it a decided superiority over the fixed light. It will, therefore, be seen that on land too the safety of traffic has been further assured by means of the AGA-system.

AGA-LIGHT-HOUSE (PANAMA CANAL)

One of Mr. Dalén's latest inventions in the acetylene illumination branch is a mixing apparatus for the purpose of mixing the gas with air in acetylene incandescent lights, so as to attain a suitable proportion giving the highest possible light effect. This apparatus, the

working of which is exceptionally economical, is of great importance for lighting railway carriages, and also for other mobile and stationary purposes.

The whole sphere of the company's operations is, of course, not embraced in this article, but it should, however, suffice to give an exposition of the rapid development of its operations. The Gas Accumulator Company was founded in 1906 with Gustaf Dalén as technical director, and reconstructed in 1909 as the Swedish Gas Accumulator Company

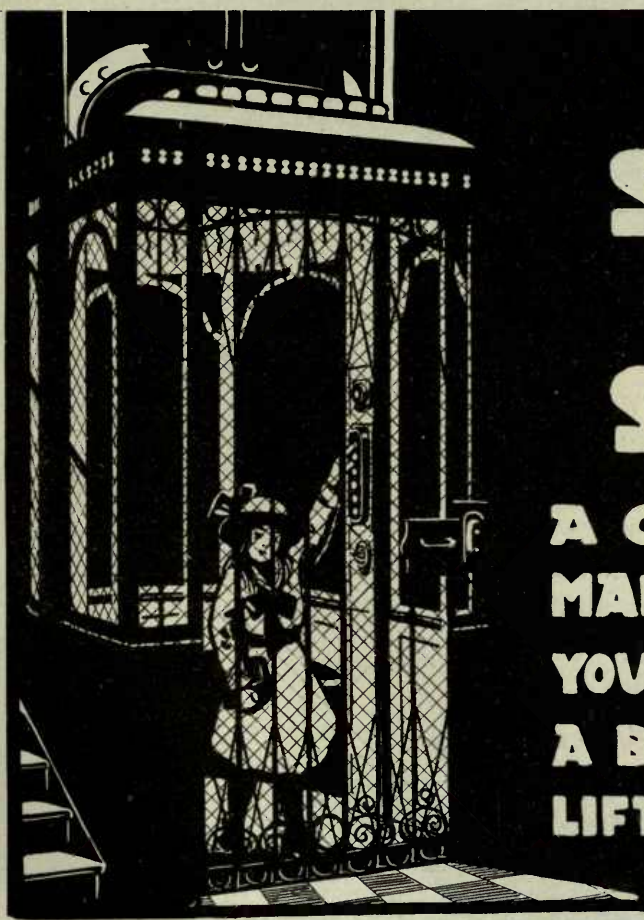


AGA-LIGHT-BUOY IN THE WORKS OF THE COMPANY AT STOCKHOLM.

with a considerable increase of the Company's capital stock, and the establishment of several branch companies in foreign countries. At the same time Mr. Dalen became the Company's managing director. The capital stock is at present 3,000,000 Swedish crowns, besides which the Company has funds at its disposal to an amount of 2,000,000 crowns.

As a reward for his "inventions of automatic regulators to be used in combination with gas accumulators for illuminating light-houses and light-buoys" Gustaf Dalén received in 1912 the Nobel prize for physics, the highest distinction in the world for technical achievements.

GRAHAM LIFTS

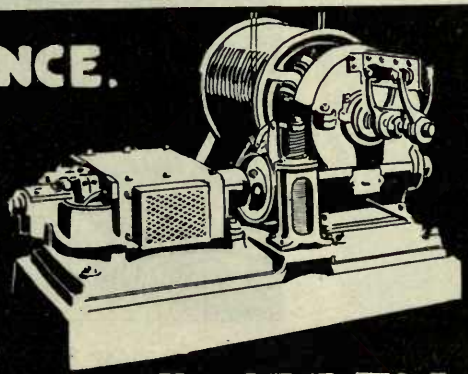


ARE
SAFE
AND
SURE

A CHILD CAN MANIPULATE IT. YOU SIMPLY PRESS A BUTTON, THE LIFT DOES THE REST

30 YEARS EXPERIENCE.

MANUFACTURED BY;



GRAHAM BROTHERS

STOCKHOLM, SWEDEN.

TELEGR. ADDRESS: »GRAND, STOCKHOLM».

THE TWO LEADING HOTELS IN SCANDINAVIA.

Finest situation in Stockholm, opposite the Royal Palace with magnificent view of the North-Stream and Lake Mälar.

250 BED-ROOMS AND DRAWING-ROOMS.

The most modern fittings in bath-rooms attached to many of these apartments.

RESTAURANTS AND CAFES

with a large Palmgarden and in summer

OPEN AIR TERRACE.

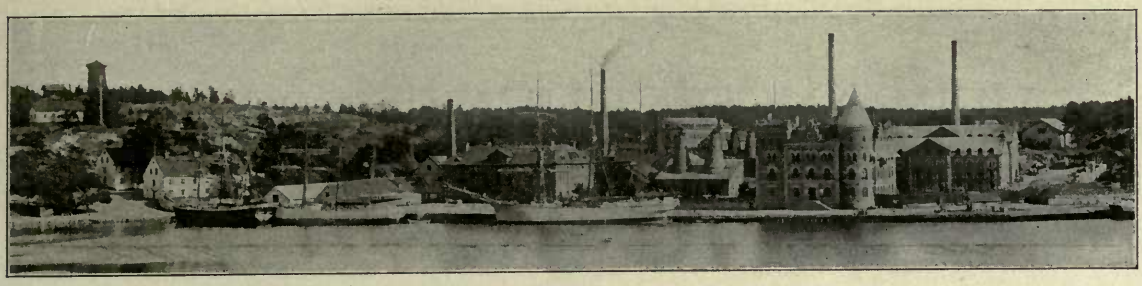
Best French and Swedish Cuisine.

AMERICAN BAR. BILLARD SALOONS.

GRAND HOTEL ROYALS PALMGARDEN.

Managing Director: NILS TRULSSON,

formerly managing director of the Hotel Kaiserhof in Berlin and the Hotel Atlantic in Hamburg.



AKTIEBOLAGET GUSTAFSBERGS FABRIKS INTRESSENTER

(THE GUSTAFSBERG PORCELAIN WORKS LTD)

GUSTAFSBERG, SWEDEN.

AKTIEBOLAGET GUSTAFSBERGS FABRIKS INTRESSENTER was founded in 1875 and is owner of the china and earthenware works which were started in 1827 by Messrs. J. H. Öhman and J. O. Wennberg at Gustafsberg, 14 miles from Stockholm, on one of those many charming islands of the Baltic constituting the archipelago, so well known for its natural beauty. Messrs. Godenius & Co. of Stockholm carried on the business from 1850 to 1875. The works have for years held a very prominent place, its products are well known, not only in Sweden but in many parts of the world.

The company produces *works of art,* which are as to shape and decoration unique and made by the artist himself in a kind of stoneware and »sgrafitto». Both these pottery-products have been made at Gustafsberg and are unparalleled.

Further reproductions, chiefly of well-known Swedish sculpture, produced in Parian, a kind of soft unglazed porcelain and various kind of ornamental ware in bone china and high class earthenware as flower-pots, vases, lamps, chandeliers, flower-tables etc., mostly in white body. A very popular decoration in underglaze, blue and green, in old style on large pieces, may also be mentioned.

The principal speciality of the works is however a various lot of household and dinner- and tea-ware, made in bone china, semi-porcelain and granite, and earthenware, with a very large range of decorations and prices, the most modern and economical methods being used. Sanitary-wares are also made, as well as electric isolators.

The yearly output is over Kronor 3,000,000: — and about 1,000 hands are constantly employed. The company has taken great measures for the well-being of its employees and the community, built as a garden city, has attracted the attention of Swedish as well as foreign experts in the social world.

Mr. O. W. Odelberg is the chief owner and director of the company since 1869.

SGRAFITTO.

HERRÄNGS GRUFAKTIEBOLAG

(THE HERRÄNG MINING CO. LTD)

STOCKHOLM, SWEDEN.

CABLE ADDRESS: »PIGIRON».

CHARCOAL PIG IRON

WORKS: 2 Blast Furnaces.

ANNUAL PRODUCTION: About 20,000 tons of Charcoal Pig Iron.

BRAND: **HERRÄNG**

ANALYSIS:

		GREY	WHITE
P	%	0.014	0.014
S	»	0.010	0.010
Si	»	0.7—1.25	0.1—0.3
Mn	»	0.20—0.30	0.15—0.25

Also other grades of Pig Iron made if required.

Port of Shipment: *HERRÄNG.*

CHARCOAL PIG IRON

B. A. HJORTH & Co. LTD.

STOCKHOLM, SWEDEN.

THE FIRM OF B. A. HJORTH & Co., which was founded more than 25 years ago and is recognized as the largest in its branch in Sweden, keeps to the production of various specialities, for which separate factories have been especially erected. The factories are fitted with the most modern appliances and turn to advantage all the latest practical improvements in technical devices. The productions of the firm are sent all over the world and enjoy a great reputation everywhere.

We here make a selection from our different productions, referring first to THE »PRIMUS» PETROLEUM GAS-COOKER AND BLOW LAMP. This apparatus, of which about 5 millions have already been sold, is an original invention of B. A. Hjorth & Co., whose special manufactory for petroleum gas-cookers and blow lamps is the largest in the world. Only pure petroleum is used as fuel; it is converted into gas through the burner. The apparatus burns without wick, smell, smoke or soot, but obtains the greatest heating effect possible from the petroleum. Cooking with the »Primus» cooker is much cheaper than cooking with wood, coal, electricity or any other ordinary fuel. Owing to the many uses to which it can be put the cooker is indispensable for every household. Combined with accessory apparatus it can be used for baking, coffee roasting, flat iron heating etc. etc.

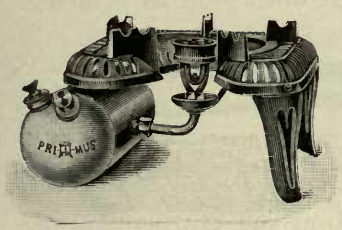


FIG. 1. »PRIMUS» COOKER.

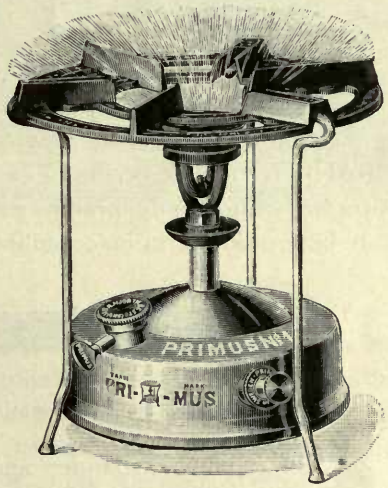


FIG. 2. »PRIMUS» COOKER.

FIG. 3. »PRIMUS» BAKING OVEN.

There are special makes of the apparatus suitable for travel, pedestrian tours, hunting, manœuvres, sailing trips etc. The apparatus can also be had in pocket form. The celebrated discoverers Nansen, Amundsen, Scott, Shackleton, the Duke of the Abruzzi, Lieutenant Filchner have taken the »Primus» cooker on their journeys and have spoken of it in the most laudatory manner. The apparatus is not in any way subject to climatic influences from heat or cold.

FIG. 4. »PRIMUS» COFFEE ROASTER.

The heating apparatus has also been made in several different forms suitable for special purposes. For instance apparatus for laboratory purposes, for heating water kettles. The apparatus for heating iron wheel tires and also the smelting stoves for line work have acquired a great reputation among railway and telegraph men.

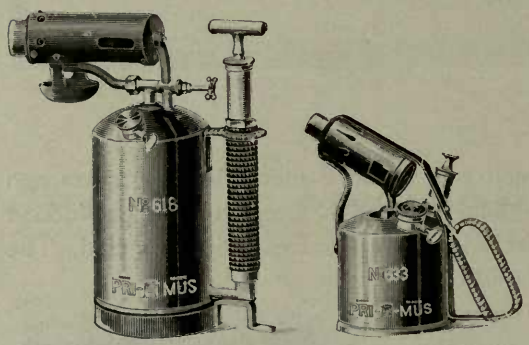


FIG. 5—6. »PRIMUS» BLOW LAMPS.

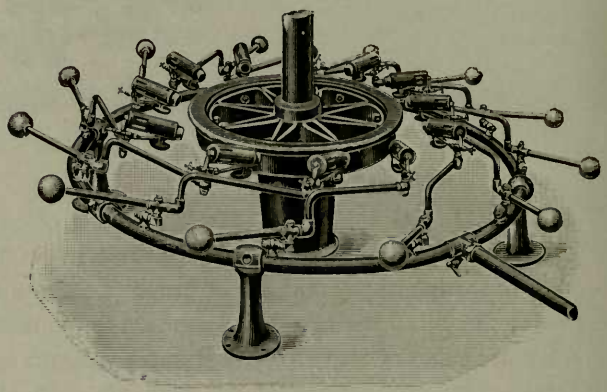


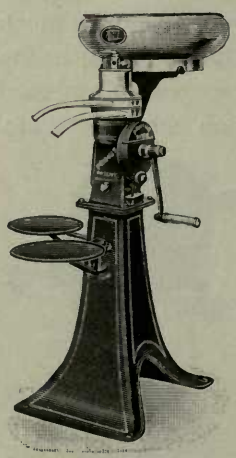
FIG. 7. »PRIMUS» WHEEL HEATING APPARATUS.

Among tools *the adjustable steel spanner* »BAHCO» and *the universal tube wrench* »BAHCO», are deserving of especial attention. They are made of best drop-forged steel. Constructed without any prominent corner or edge the screw spanners and tube wrenches »Bahco» can be employed in inaccessible and almost unattainable places where other tools are of no use.

FIG. 8. »BAHCO» SPANNER.

FIG. 9. »BAHCO» UNIVERSAL TUBE WRENCH.

The »Bahco» spanner and tube wrench are of convenient form and can be regulated and worked with one hand only, a very great advantage in fitting work. In the model of the spanner the especial shape of the grip, which represents the only theoretically correct angle (15°), should especially be observed, Fig. 8.



The new tube wrench can be used for many different purposes besides its ordinary application. Thus, it can be used to draw out nails, even those without a head; they can also be used as nut-keys and vices etc. etc.

B. A. Hjorth & Co. offer those engaged in farming a useful machine in their MILK SEPARATOR »PRIMUS». This separator was constructed by the Firm with the definite view of putting on the market an absolutely first class machine not too expensive for the requirements of the small farmer. Made of the very best Swedish material the machine is of comparatively small size and also of correspondingly slight weight.

Owing to its small measurements and light weight the machine is particularly suitable for export.

The number of parts subject to wear and tear is reduced to a minimum. Cleaning, oiling, as also the management of the machine, are extremely simple. The action is easy and silent, the cream-separating process very complete. The Separator is manufactured in different sizes skimming from 90 to 360 litres pr hour and with or without pillar support. The machines for 155 litres upward per hour can also be delivered to be run by strap.

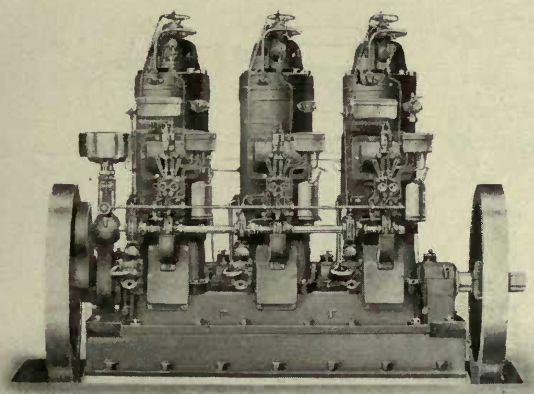


FIG. 10. STATIONARY ENGINE, 138 H. P.

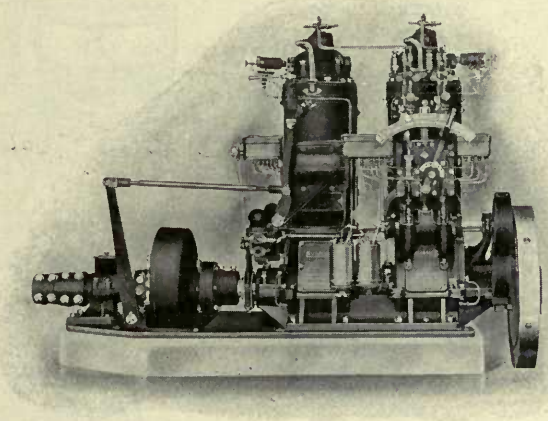


FIG. 11. MARINE ENGINE.

Well-known are also the CRUDE OIL ENGINES »AVANCE», in United States registrated under the name of »VANC». The »AVANCE» engine was the first hot bulb engine of the 2-cycle system, that was constructed in Scandinavia, and it has lead the evolution of that industry in Europe. These engines work with the cheapest crude oils and Russian Masuts, Astatké, Texas Crude Oil, Californian Crude Oil and crude oils from Mexico as well as with kerosene. Because of the patented waterinjection in the top of the hot bulb, the combustion is almost complete and consequently the consumption of fuel as low as possible.

The »AVANCE» engines are delivered for stationary, portable and marine purposes. Of the stationary and portable engines are delivered both vertical and horizontal types. The marine engines are all vertical and of following executions: with reversing gear, with reversible propellerblades, direct reversible by explosion and direct reversible by compressed air.

We also will point out our motor-plough »AVANCE» driven by an usual crude oil engine »AVANCE», as being the cheapest, lightest and most suitable motorplough in the market.

Simple construction.
Easy start and management.
Easy to erect.
No valves for the explosion chamber.
Very small consumption of fuel and lubricating oil.
Temperature regulation contrivance for the flame head.
The best materials and the most careful execution.
Smell- and dust-free.
Small weight, little space required.
Reliable, safe and uniform action etc. etc.

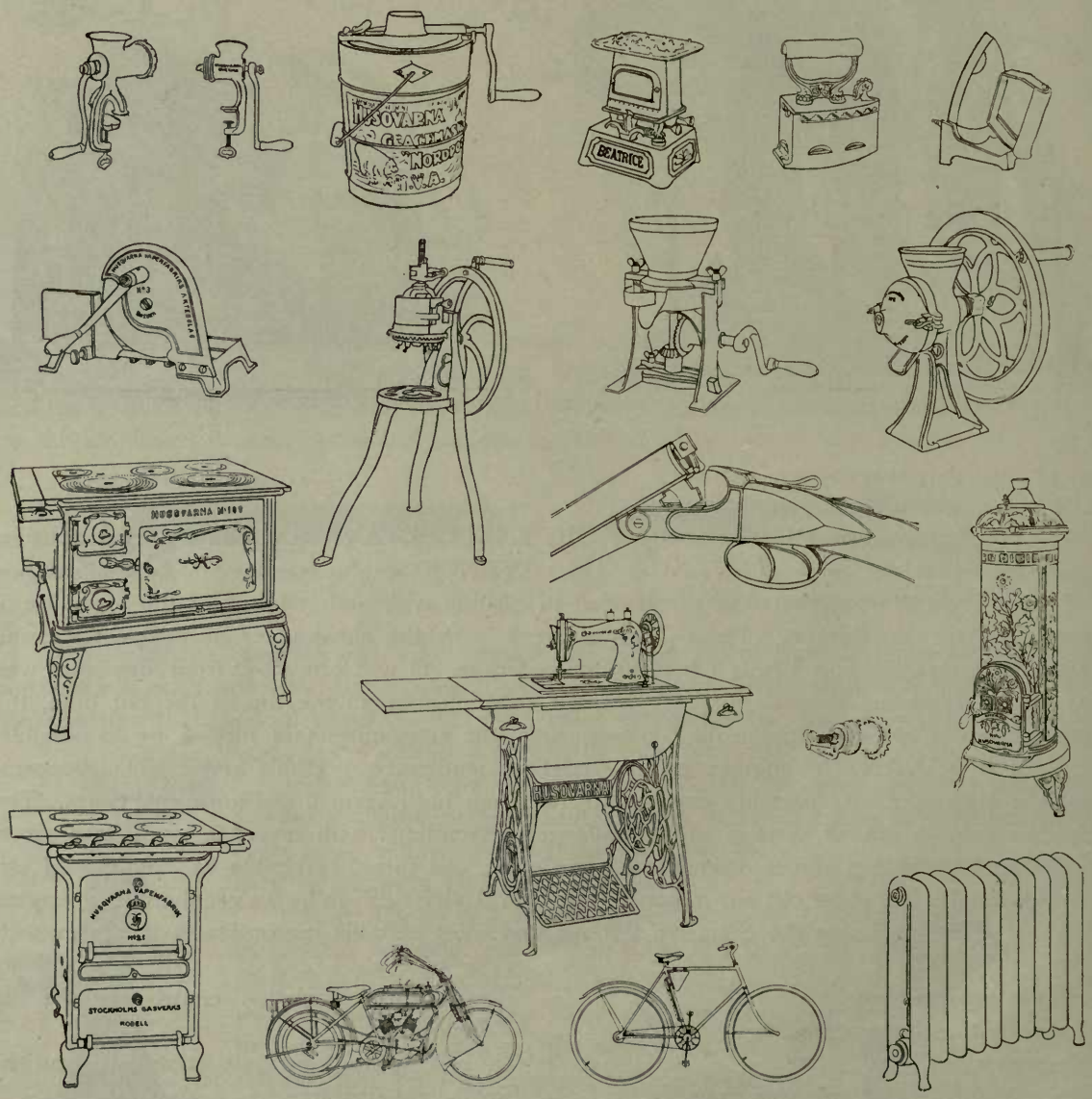
HUSQVARNA VAPENFABRIKS AKTIEBOLAG

HUSQVARNA — SWEDEN

FACTORY ESTABLISHED BY A ROYAL PRIVILEGE OF 1689

THE ANNUAL TURN OVER AMOUNTS TO ABOUT KR. 7,700,000 EQUAL TO ABOUT $ 2,100,000

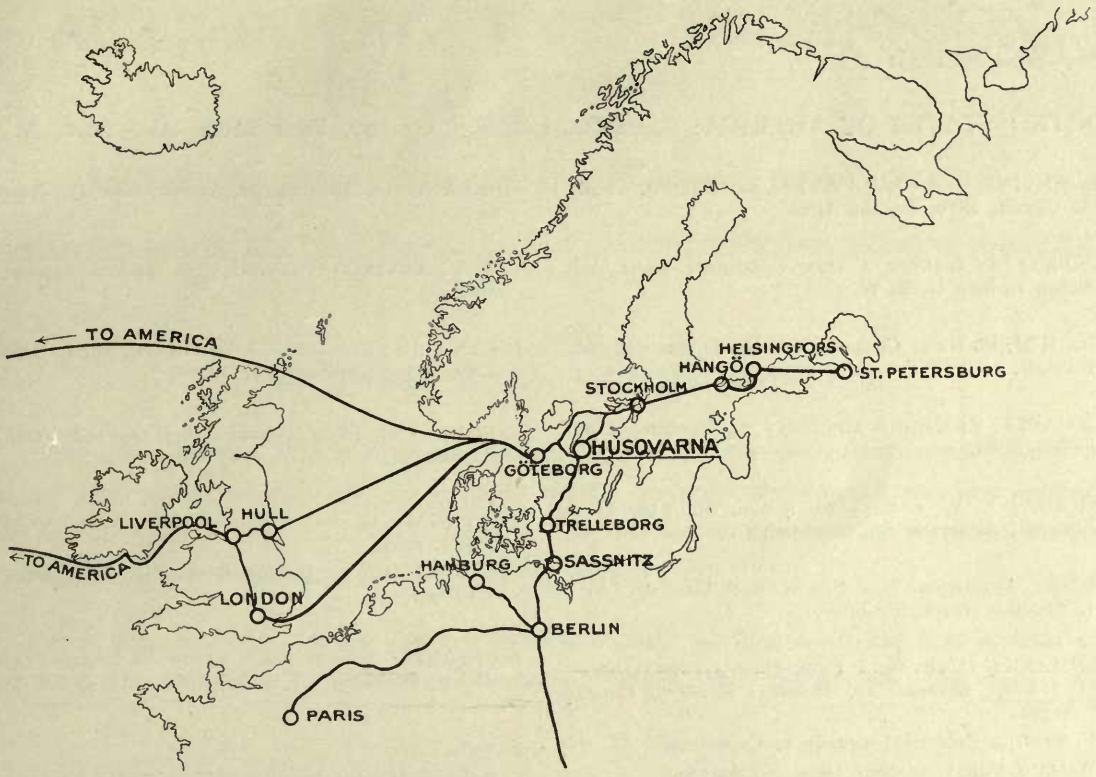
ABOUT 1,800 HANDS EMPLOYED.



Largest makers in Scandinavia of:

GENERAL FOUNDRY GOODS

SEWING MACHINES · BICYCLES AND COASTER HUBS · SHOT GUNS



Export specialities:

MEAT MINCING MACHINES AND FOOD CHOPPERS.

BOX IRONS.

ICE-CREAM FREEZERS.

PETROLEUM COOKING STOVES.

FRUIT PRESSES.

MEAT JUICE EXTRACTORS.

BREAD AND BACON CUTTING MACHINES.

SUNDRY HOUSEHOLD ARTICLES.

BONE CUTTING MACHINES FOR POULTRY FARMERS.

MAIZE- AND CORN-MILLS.

PAINT MILLS.

COOKING RANGES for gas, wood and coal.

STOVES for coal and wood.

HEATING RADIATORS.

THE »MIKADO» COASTER HUB WITH BRAKE.

See also next page.

AGENCIES:

UNITED STATES OF AMERICA: SCHUCHARDT & SCHÜTTE, 90, West Street, *New York, N. Y.*

ARGENTINE AND URUGUAY: G. W. EDLIND, Casilla de Correo, 1870, Buenos Aires.

AUSTRALIA: WALTER A. COX, COMMERCE BLDS. Ash Street, Sydney N. S. W.

BELGIUM: FLORENT COLLIN, Chaussée de Waterloo 500, Brussels.

BULGARIA: ZISMANN & HEGYESSY, 25, Boulevard Donkudoff, Sofia.

CANADA: F. W. LAMPLOUGH & Co., 606/610, Unity Bld., 46, Alexander St., Montreal.

CHINA: ANDREWS, VON FISCHERZ & GEORGE LTD., 1, Foochow Road, Shanghai.

DENMARK: HUSQVARNA FABRIKERS GENERALDEPOT — *Sewing Machines* —, Holmens Kanal 3, Copenhagen.

F. ROHDE, Frederiksborggade 5, Copenhagen.

WILLUM FÖNSS — *Shot Guns* —, Aarhus.

ALFRED SÖRENSEN — »*Mikado Hubs*» —, Brandes Allé 16, Copenhagen.

EGYPT: C. W. DE GERBER, Alexandria.

ENGLAND: MOELLER & CONDRUP LTD., 78, Fore Street, London E. C.

FINLAND: O/Y. K. HJORTH AKTIEBOLAG, Tammerfors.

AKTIEBOLAGET HUSQVARNA — *for Helsingfors only* —, Alexandersgatan 54, Helsingfors.

OMPELUKONE O/Y. HUSQVARNA SYMASKIN — *Sewing Machines* —, Tammerfors.

HUSQVARNA OMPELUKONELIIKE — *Sewing Machines* —, Uleåborg.

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GERMANY: WILHELM F. HENNINGS, Gothenstrasse 10/16, Hamburg.

JOHANN VON BARGEN, Alexandrinenstrasse 95/6, Berlin.

GREECE: F. FORNARO, Rue St. Philothée 1 A, Athens.

GUSTAVE SAHLIN, Salonica.

HOLLAND: S. MINKENHOF, Vossiusstraat 43, Amsterdam.

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NORWAY: H. PARR SAMUELSON, HUSQVARNA OPLAG, Christiania.

PORTUGAL: GASTON FLEGENHEIMER, Aribau 68, Barcelona, Spain.

ARTHUR EMAUZ — *Sewing Machines* —, Rue Garret 56, Lisbon.

ROUMANIA: MARGULIUS & FICHMANN, Strada Academiei 6, Bucharest.

RUSSIA:

FABRIK HUSQVARNA, Kühleweinsche Strasse 1, Riga — Thorensberg. *Own factory and store.*

ALBIN BADE, Gorochowaja 32, Petrograd.

E. BARBER, Mjasnitzkaja 20, Moscow.

LEO LEBEDOW, Altstadt 19, Riga.

EDV. TROSZEL, Trebacka 4, Warsaw.

J. CONSTABEL & Co., Rybnaja 18, Kharkoff.

ALFRED MOLENAAR, Malo Podwalnaja 1, Kiew.

EMIL ROTHSTEIN, Rostow a/Don.

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N. GOLUBOW & F. PIEKARSKI, Tiflis.

WARSCHAUER JÄGERGESELLSCHAFT — *Shot Guns* —, Warsaw.

SOUTH AFRICA: FRED. W. RICHMOND, MUTUAL BUILDINGS, Cape Town.

SPAIN: GASTON FLEGENHEIMER, Aribau 68, Barcelona.

SWITZERLAND: GEISER & Co., Langenthal.

A. LADERMANN — *Mikado Hubs* —, 4, Quai Pierro Fatio, Geneva.

TURKEY: WALTHER BERGHAUS, Constantinople.

GUSTAVE SAHLIN, Smyrna.

AKTIEBOLAGET C. E. JOHANSSON

ESKILSTUNA, SWEDEN.

REPRESENTED IN AMERICA BY:

GRÖNKVIST DRILL CHUCK Co., 18 MORRIS ST., JERSEY CITY, N. J.

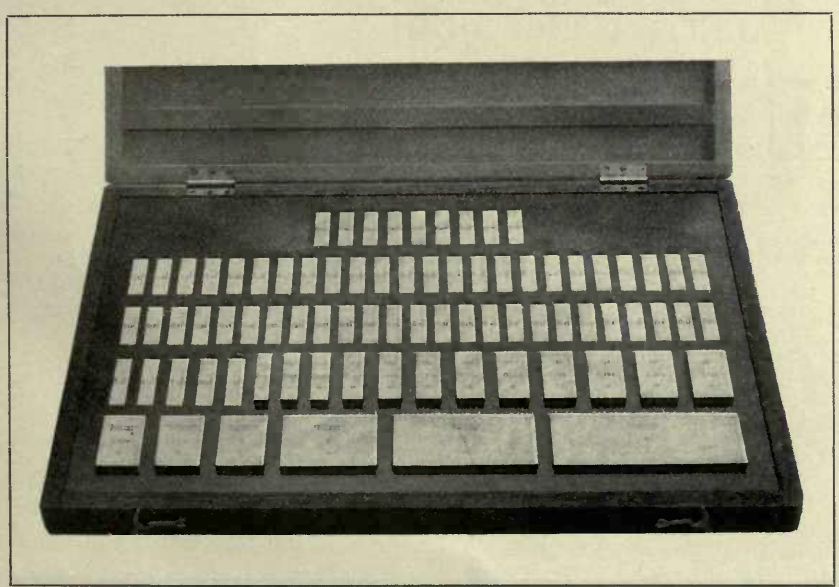
SHOP SYSTEM AND LIMIT SYSTEM.

No manufacturing shop to-day can continue to meet the ever-increasing competition if the various parts of the product are not »manufactured». In order to »manufacture» it is necessary that the shop has a heart: a TOOL ROOM. Skilled tool-makers and an ingenious foreman are required to make the necessary cost-reducing tools.

It is true that large output depends upon first class machine tools, but it is equally true that profitable manufacturing, whether on a large or small scale, depends upon the shop system.

THE LIMIT SYSTEM IS TO-DAY RECOGNIZED AS THE MOST PROFITABLE SHOP SYSTEM.

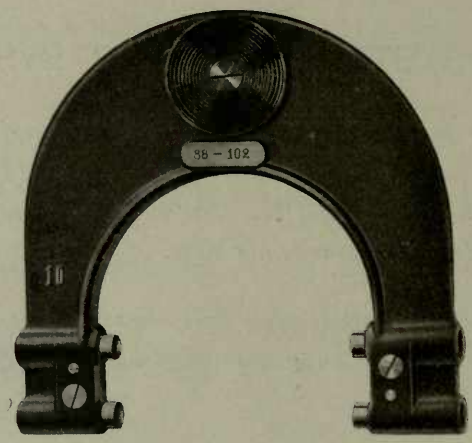
Different limits of tolerance are laid down for different parts and in this way not only interchangeability, but also inexpensive manufacturing is assured. Each part is produced with exactly the required accuracy — no more, no less. Assembling expenses are reduced to a minimum.



The limit system has the JOHANSSON COMBINATION STANDARD GAGES for a basis as these gages are indispensable for reference in the tool-room and for checking in the inspection department. *It is a reference gaging system.*

The limit system is particularly profitable *when the* JOHANSSON ADJUSTABLE LIMIT SNAP GAGES *are used in the shop.*

The objection to the use of ordinary Snap gages has been the expense. Snap gages give security but those used heretofore don't last nearly as long as, for instance, a micrometer. We know of one concern where more than a thousand snap gages are in constant daily use. The cost of each snap gage is at least $2 — and they do not stand more than a fortnight's actual use. Calculate the yearly cost.



Our JOHANSSON ADJUSTABLE LIMIT SNAP GAGES will, on the other hand, last for years because, when worn, they are simply turned over to the inspector for resetting. We know positively that our tool will effect a tremendous saving in your present cost of snap gages. These facts are worth while looking into. Ask for our circulars.

LARSBO-NORNS AKTIEBOLAG

OWNERS OF

THE WIKMANSHYTTAN IRON AND STEEL WORKS

WIKMANSHYTTAN — SWEDEN.

Manufacturers of:

CRUCIBLE CAST STEEL of the finest quality. Brands CRU and  (Rose).

TOOL STEEL, hammered, in all dimensions.

ROLLED STEEL WIRE, 5 mm. diam. and upwards, an excellent material for »music wire»!

DRAWN STEEL WIRE & BARS, 1 mm. and upwards to 100 mm. (4″).

BLANKS FOR STAMPS; Cutters, Grinders etc.

ALLOY STEEL for different purposes.

Stone-cutting- and smithy tools; HAMMERS and small castings.

Speciality:

HIGH SPEED STEEL

Brands CRU EXCELSIOR — CRU EXCELSIOR EXTRA & CRU EXCELSIOR EXTRA XII

All made from the well-known

CRUCIBLE CAST STEEL OF WIKMANSHYTTAN.

PIG IRON, low percentage of sulphur and phosphorus.

Brand N B (Ö B)

Address: WIKMANSHYTTAN, SWEDEN.

LJUSNE-WOXNA AKTIEBOLAG

LJUSNE — SWEDEN.

THE Swedish Lancashire Iron (wrought iron) has for centuries enjoyed the highest reputation and is still the leader in iron and steel products as far as quality and pureness are concerned.

In the year 1671 the first blast furnace of the Ljusne Works was erected, out of which have developed the largest Lancashire iron works of present time, situated at the sea on the west coast of the Baltic on both sides of the Ljusne river.

Rolled Lancashire Charcoal bars of the brand L. W. as well as rough bars of the LTS brand are known all over the world.

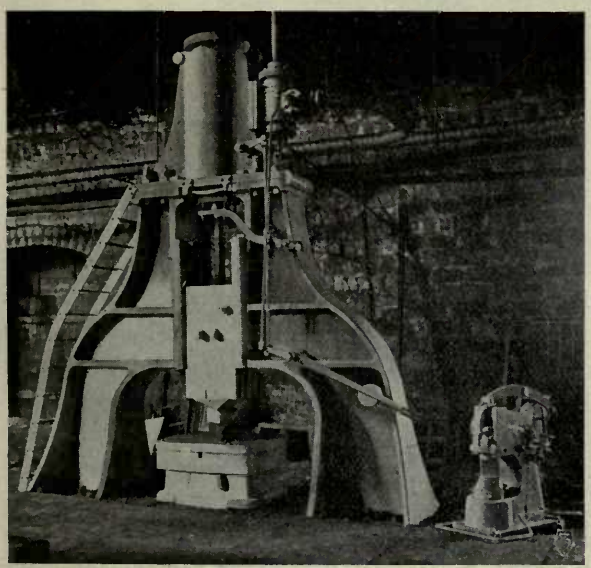
The blast furnaces are fed with the purest Swedish ores and charcoal, which latter is produced of waste wood from the forests through distilling whereby such by-products as Tar, Tar-Oil, Turpentine, Acetic Acid and Wood Alcohol are taken advantage of.

LJUSNE NORTH WORKS.

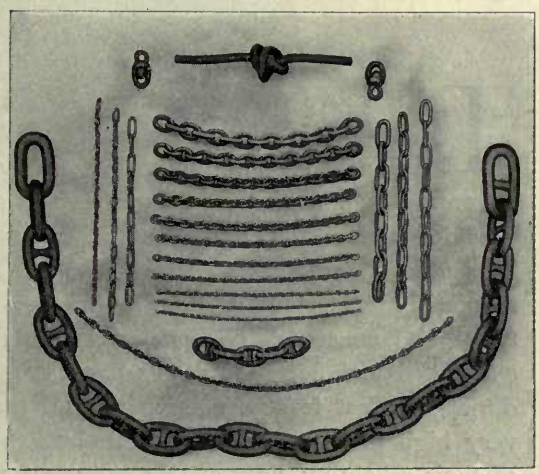
WOOD DISTILLING PLANT.

The Ljusne-Woxna Co. Ltd. also manufactures Steam Hammers, Spring Hammers, Chains, Motor-Boats, Motor-Trollies and Diesel Engines. The steel and iron castings for the shops are furnished by their own electric steel and iron foundries, three steelfurnaces of the Rennerfelt-system being in operation.

Besides the iron and steel business the Company is also a large manufacturer and exporter of sawn goods.



LJUSNE HAMMERS.



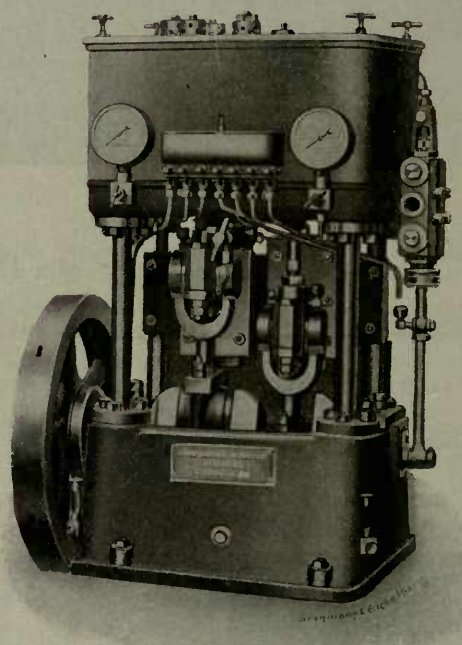
LJUSNE CHAINS.

LUDWIGSBERGS WERKSTADS AKTIEBOLAG

(THE LUDWIGSBERG WORKS LTD)

ESTABLISHED 1843.

TELEGRAPHIC ADDRESS:
»LUDWIGWERK STOCKHOLM»

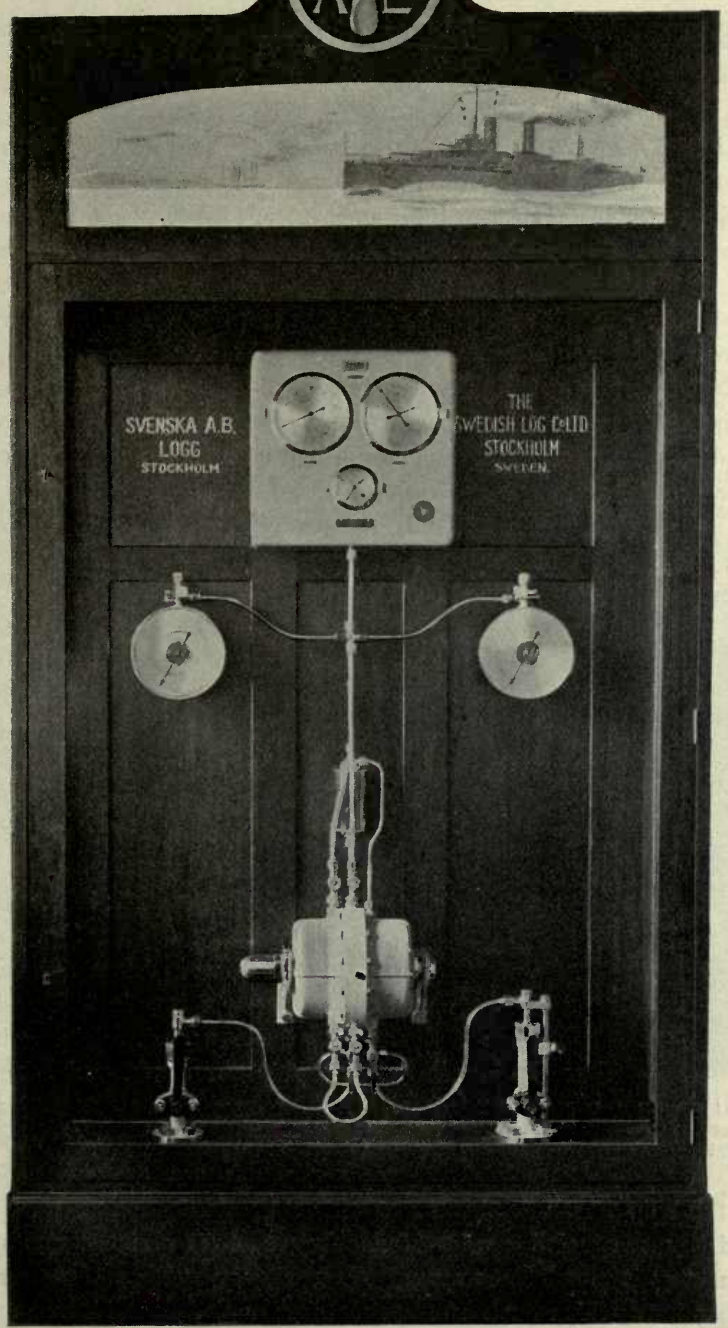


THE above firm specializes in all kinds of pumps, steam and motor fire-engines, high-pressure air-compressors, ice and refrigerating machines, steam turbines etc., etc. All these products have, during the course of years, come into very great demand. The manufacture of centrifugal pumps comprising a number of different types and sizes, among which such as are used for high lifting, up to 500 m. (1,650 feet), are worthy of special mention. The same may be said of steam-turbines for small needs, chiefly for the driving of pumps, and dynamos for illumination purposes on board ship etc. The turbines are made according to the »Electra-type» and consequently work with relatively few revolutions, which means that cog-gearing is eliminated and noiseless running is obtained. The manufacture of compressors has, especially during the last few years, experienced great progress. It chiefly consists of compressors for very high pressure (up to 300 atm.) which are much in demand for torpedo work. On account of their reliability, light weight and great capacity the Ludwigsberg patented compressors have been adopted by nearly all European navies and by many of the navies of non-European countries.

SVENSKA A.-B. LOGG

SHOW-CASE
AT THE
SAN FRANCISCO
EXHIBITION 1915

(COMPLETE SET OF APPARATUSES OF A 40 KNOT LOG WITH TWO SPEED-INDICATORS AND ONE COMBINED SPEED-INDICATOR AND DISTANCE-RECORDER.)



SVENSKA A.-B. LOGG

THE SWEDISH LOG CO. LTD, SWEDEN

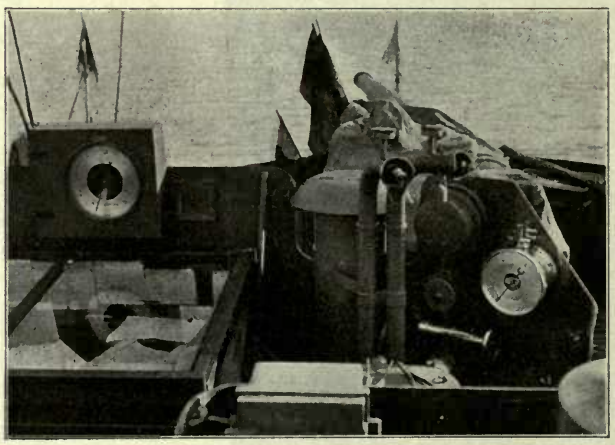
STOCKHOLM.

TRADE MARK

TRADE MARK

THE SWEDISH LOG CO. LTD, Stockholm, was founded in February 1914 for the purpose of manufacturing log-apparatuses and other nautical instruments according to the inventions of Messrs Torsten Jung and Gustaf H. Petersson, Swedish engineers. The log constructed by the said inventors is exact, reliable and up to date. It is suitable for all sorts of vessels and the results of the trials with this log prove that it is unrivalled for measuring not only the speed but also the distance run by the ship. Corresponding to the initials in the Swedish name of the company the log is called the SAL-log.

The SAL-log system is principally founded on the Pitot-tube, which since 1728 has been used for measuring the speed of fluids and gases. The principle upon which the log is based is absolutely reliable, being scientifically proved, but its practical application depends on very accurate instruments. This is the reason, why several apparatuses based on this principle have not proved successful. Those difficulties have been studied and overcome in the SAL-log system with its perfect instruments, making this log-system superior to other systems based on the same or other principles.



SAL-LOG INSTALLED ON A SWEDISH DESTROYER.
COMPLETE INSTALLATION OF A 40 KNOT LOG: TO THE LEFT A COMBINED SPEED AND DISTANCE REGISTER AND TO THE RIGHT A SPEED INDICATOR.

There are no rotary or otherwise movable parts in the water, such parts never being reliable in the long run. The log can not be damaged by the ship going astern or by other ships, as may be the case of a log towed by the ship. The log is entirely automatic and requires practically no attention except winding a clock belonging to the distance-recorder of the log. All the pipes are frost-free. When adjusted to the ship the log will remain adjusted during an indefinite period. The log is accurate for the highest speed and even speeds as low as 2 or 3 knots are indicated. It gives accurate readings in any weather and in rough sea as well as in smooth water. The draught of the ship has no influence at all on the indication of the log, this influence being neutralized by a special »static»-tube. Any amount of instruments can be fed from one Pitot-tube, making it possible to mount the necessary number of instruments in any place of the ship. In big battle-ships such arrangements are made, that all instruments work perfectly

independent of each other. Thus if one or more of the instruments are brought out of action by the fire of the enemy, or otherwise, the rest of them will continue to give correct readings.

The Pitot-tube is arranged in such a way that the tube may be quickly drawn in if necessary, as for instance, when the ship goes into dock or into a harbour where the water is shallow at the quay. The same will be the case with a sub-marine diving to the bottom. On the other hand the tube may be pushed out and replaced by a new one in a couple of minutes, if it should get hurt outside the ship.

Last summer a SAL-log was installed onboard one of His Swedish Majesty's destroyers and after the adjustment of the log the final tests gave the following results:

Speed trials					Distance trials	
Measured distance. Miles	Real speed. Knots	Average speed in knots showed by the SAL-log		Distance read on the recorder of the log. Miles	Distance according to	
		speed indicator on the bridge	speed indicator of the combined instrument		chart	SAL-log
6′175	20,59	20,63	20,56	6′17	6′6	6′5
3′55	12,44	12,38	12,40	3′54	10′3	10′3

On account of the remarkably successful results of the trials carried out onboard the said destroyer whereby the valuable qualities of our automatic instruments also were proved, the Admiral in command of the Royal Swedish Coast-fleet has recommended the SAL-log to be introduced on the ships of the Royal Navy.

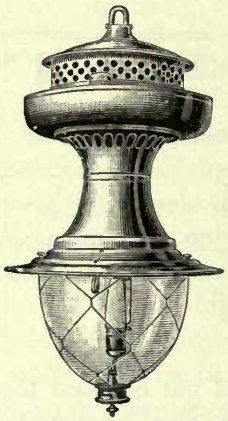
The SAL-log is constructed and very well adapted for sub-marines when it of course is of great value both for the navigation and the attack to have an instrument showing accurately the speed of the vessel at any instant as well as the distance run.

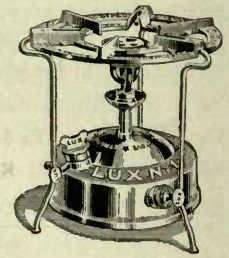
When the log has actually shown such good results on warships with varying speed it is hardly necessary to point out that it is an excellent instrument for liners and other merchant-ships, it being anyhow very important onboard such ships to observe the differences in speed caused by wind and sea and to register the distance run by the ship during a certain time or on a certain course. — Trials carried out onboard s/s Hyperion during a whole summer have been very successful and the company has no doubt that the SAL-log will be greeted as a most valuable navigating-instrument helping to avoid many a disaster where life and property could be lost.

Stockholm December 1914.

AKTIEBOLAGET LUX

STOCKHOLM, SWEDEN.





LUX Incandescent kerosene oil vapor lamps of 200—2,000 c. p.

LUX Kerosene oil cooking stoves and ranges.

LUX Soldering and blow lamps for kerosene oil and gasoline.

LUX Portable suction cleaners. Greatest efficiency. First class workmanship. Best material.

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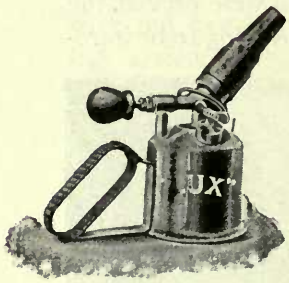

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CHILE: Holmgren Hnos, Santiago.
PERU: A. Bergstrand, Lima.
AUSTRALIA: Lux Light Co. of Victoria, Melbourne.
Lovelock & Co., Brisbane.
NEW ZEALAND: Lux Light Co., Wellington.
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AUSTRIA: Lux Licht Gesellschaft m. b. H., Wien.
BELGIUM: Lux-Bruxelles Soc. An., Bruxelles.
BULGARIA: Radoutcheff & Boyadjieff, Sofia.
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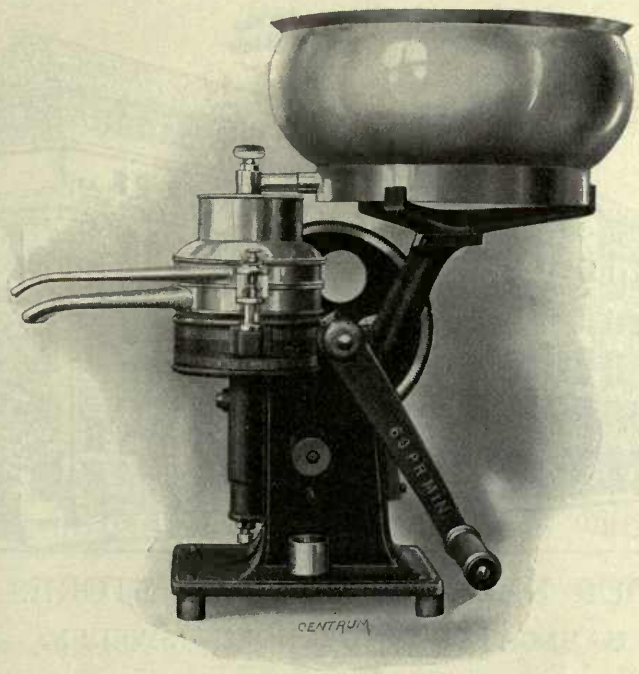

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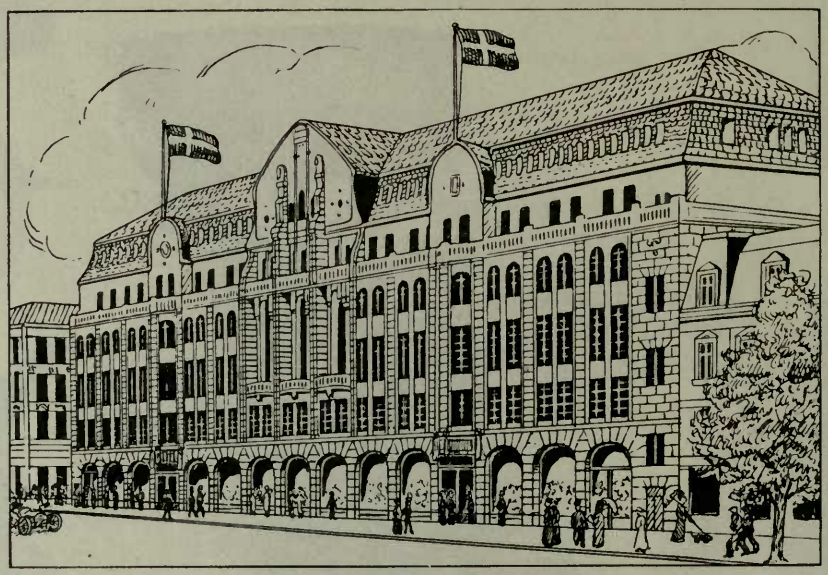

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Besides the above the firm also sells:

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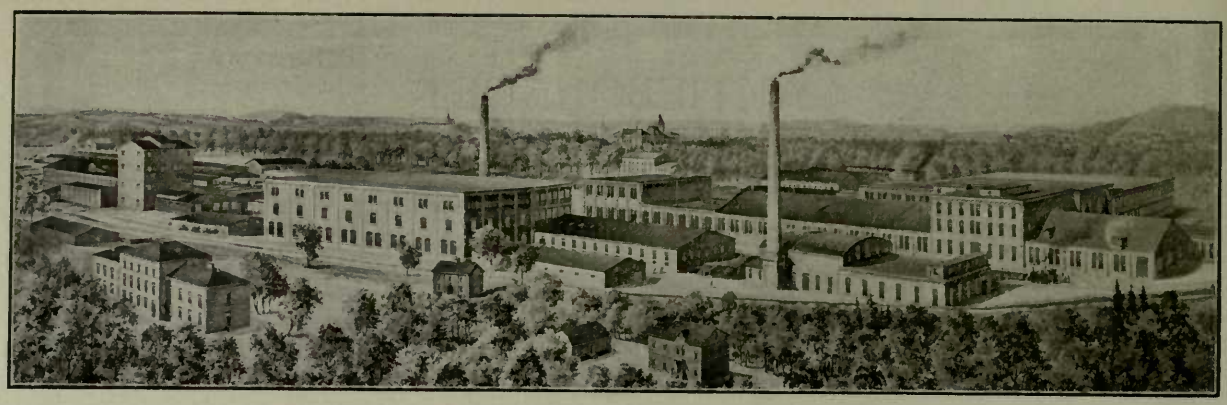
WIRE NAILS, WROUGHT OAK NAILS,
DEAL NAILS and BOAT NAILS.
HORSE SHOES, HORSE NAILS,
STEEL FROST NAILS.
SHOVELS, SPADES, PITCH FORKS and HAY FORKS, etc., etc.



PAPYRUS LIMITED

(AKTIEBOLAGET PAPYRUS)

MÖLNDAL.

PAPYRUS LIMITED was founded in 1895 with the purchase of the Korndal factory at Mölndal near Fässberg's railway station, about 7 miles from Gothenburg, where for some considerable time the paper industry had been carried on. The old establishments were, however, then out of date, and no pains were spared in thoroughly re-building and modernising the works. This work of reconstruction has until recently been energetically conducted with the result that the mill is to-day one of the most efficient in its branch.

The company has at present a share capital of Kr. 3,000,000 and derives its motive power partly from its own waterfall in the Mölndal river, partly from the large water-power station at Yngeredfors, and also from its own steam-turbine station. The paper mill and the sulphite mill, the latter of which has been erected during recent years and extended in the course of the present year, now employ over 600 hands.

The chief productions are the so-called »fine quality papers» such as book-, post- and writing paper, as also superior kinds of printing paper for the Swedish market. Besides these, however, the company carries on an unusually extensive special manufacture of coated or coloured paper, such as illustration paper and art-printing paper, and board, imitation leather, glazed paper, glacé paper and fancy papers, etc.

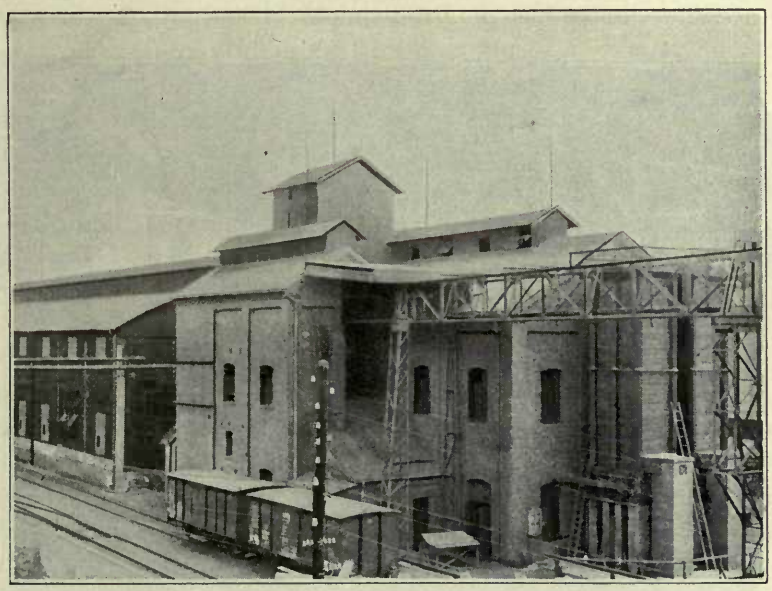
All these various productions are now, owing to the great care that has been bestowed on their manufacture, characterised by their perfect finish combined with reasonable prices and have thereby gained an ever-increasing market all over the world.

ARTHUR RAMÉN

HELSINGBORG, SWEDEN.

ONE of those who has during recent years considerably assisted in the development of Chloridising Roasting based upon the extraction of ore by the wet process, is Mr. A. Ramén, who has for many years been employed as technical superintendent at Helsingborg's Copper Works in Sweden.

Mr. Ramén is one of the inventors of the mechanical furnace on the Ramén-Beskow system. The experiments carried out in connection with this furnace at the above-mentioned



works undoubtedly mark an epoch in the history of the Wet Process for the extraction of ore, not merely from a technical point of view, but also as regards economy and hygiene. The significance of the invention will be best understood from the fact that Ramén-Beskow's furnace within 4 years has surplaced hand-furnaces at nearly every European copper extraction works, so that at least 90 % of ore prepared by Chloridising Roasting is done with the aid of these furnaces.

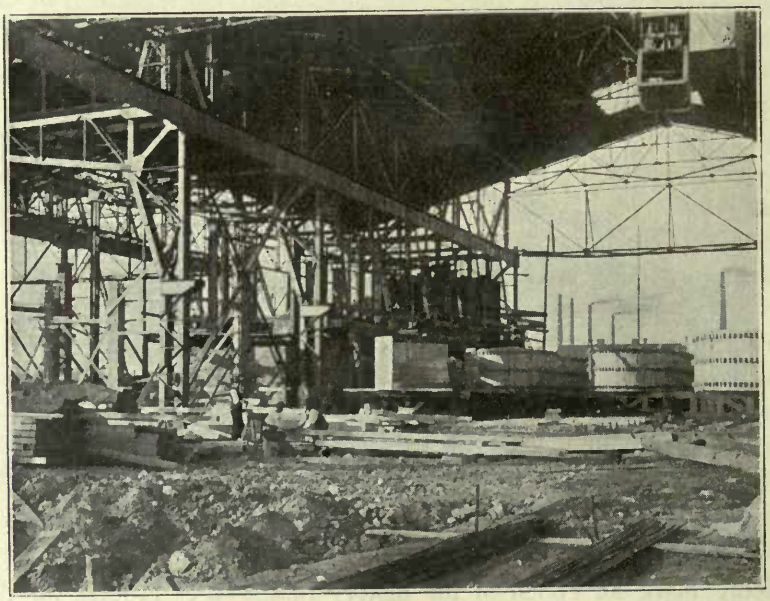
Mr. Ramén has been eminently successful in improving other processes in connection with the wet process for the extraction of ore. Through the application of several improvements, many of which have been patented, the costs of extraction have been reduced to about a $^1/_4$ of what they were some years ago according to the standard method. The

consequence of this is that a new field has been opened for the use of the Chloridising Roasting and the Ore Extraction. This industry, which could previously only be used in connection with pyrites and ores holding a high percentage of copper, can now be very advantageously applied for pyrites and ores having but a low percentage of copper or as little as even 1 %, or in value corresponding to a quantity of other metals such as gold, silver, zinc etc. In consequence of these facts several new copper extraction works have been built in Europe according to Mr. Ramén's drawings especially for the purpose of preparing copper-ores of low percentage.

These Ramen-methods and constructions ought to be of exceptional interest to those engaged in the American copper industry with its comparatively high wages, since they are to a very great extent based upon the application of mechanical aids so as to reduce the costs and number of hands.

Mr. Ramén has also constructed Tunnel Furnaces for burning ore briquettes, which construction is covered by letters patent in most civilised countries and which have been adopted by several leading European firms.

Mr. Ramén, who resides at Helsingborg, delivers drawings for complete extraction works for copper, zinc etc.



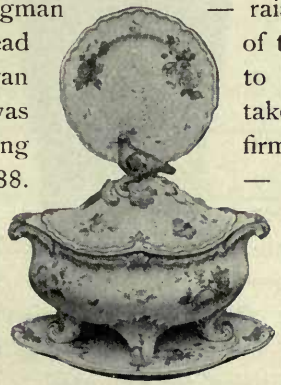
Rörstrand

THE RÖRSTRAND FACTORY was founded in the year 1726. It is one of the oldest earthenware factories in Europe, and in all probability is the one that has for the longest time continued to carry on its work at the original place of its foundation. Up to the close of the eighteenth century the productions of the firm consisted of so-called Delft porcelain, that is to say yellow burned faience with non-transparent glaze. One of the productions of the first years' work is represented by Fig. 1., a tray with a blue painting representing the Children of Israel making merry at the foot of Mount Sinai. It was manufactured in 1733 and is now preserved in the Rörstrand Museum. Fig. 2. depicts a Rörstrand bowl dating from 1760.

FIG. 1.

FIG. 2.

During the first two decades of the factory's existence the results, both from a technical and an economical point of view, gave but little satisfaction, and it was not before 1740, when Anders Fahlström became responsible for the factory's technical management, that the work produced bore signs of any perfection. After Mr. Ingman — raised to the peerage under the name of Nordenstolpe — became the head of the factory in 1753 and a few years later its sole proprietor, the firm began to be a paying concern. When Nordenstolpe died in 1773 the business was taken over by his son, who in 1782 also bought Marieberg, a competing firm established in the year 1758. The latter factory was discontinued in 1788. — On the next page there are some of the Rörstrand trade marks from that period.



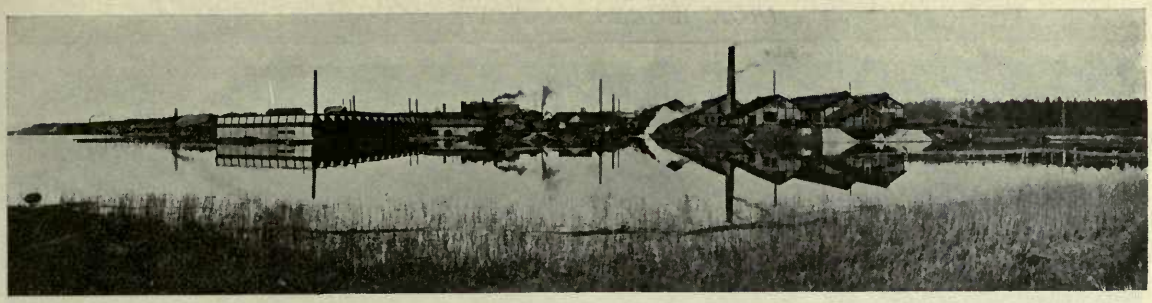
Towards the end of the eighteenth century the manufacture of non-transparent glazed faience gave way to the so-called flint porcelain, especially devised to resemble the fine productions of faience known as Queen's Ware, which had been manufactured by Wedgwood in 1760. — The manufacture of this kind of porcelain at the Rörstrand factory was during the first decades conducted according to methods then in vogue in Germany, and it was not before the year 1820 that the superior English system was introduced.

After Nordenstolpe's heirs Rörstrand came in 1797 into the hands of Mr. B. R. Geijer, General Manager of the Royal Mint, and after his death in 1815 it became the property of »B. R. Geijer's Heirs». The business was continued under the name of »B. R. Geijer's Heirs» until the year 1868. Rörstrand had, however, some time previously been sold by

Mr. Fr. Geijer, Mr. P. Lagerhjelm and others to Mr. N. W. Stråhle, who, in 1846 became the sole owner of the factory. On his decease, in 1852, it again changed hands, being inherited by his heirs and later on was purchased by Messrs. G. H. Stråhle, N. C. Claëson and Rob. Almström who turned the business into a limited liability company in 1868 under the name of »Rörstrand Limited».

Under the management of G. H. Stråhle and Robert Almström the business developed in a remarkable manner. In the year 1850 200 hands were employed and the value of the gross production was about 248,000 Kronor, while in 1900 about 900 workmen were in the employ of the firm and the gross production had increased to about 2,900,000 Kronor. Mr. G. H. Stråhle resigned his position in 1892 and Mr. R. Almström remained as sole director until 1910, when he was succeeded by his sons Harald and Knut Almström, who are now the managers of the company. — In the year 1911 the old company was divided into two independent concerns, viz, »The Rörstrand Factory Limited» and »The Rörstrand Estate Company Limited», of which the first-mentioned has a share capital of 2,800,000 Kronor. In 1913 the company was able to show a gross production of 3,300,000 Kronor, and employed about 1,000 workmen. — The company is just now about to remove the factory to their Islinge estate at Lidingön, an island in the close proximity of Stockholm, where during the next few years a fully modern factory is to be erected by a newly formed company, with which is amalgamated »The Gothenburg Earthenware Factory» which has successfully carried on the manufacture of faience. — The productions of Rörstrand, which consisted only of earthenware, in 1913 up to the year 1850 this majolica, stove-tiles, lavatory comprised besides plates, bone and felspar china, as well as insulators for electric articles and prepared plaster of Paris. The company also carries on a mining business for the extraction of felspar and quartz of which considerable quantities are exported.

The manufacture of objects of art of genuine porcelaine such as vases and groups of animals etc. which the company has taken up, has received great recognition and these artistic productions are much in demand on the continent.



THE SANDVIKEN IRON WORKS.

THE SANDVIKEN IRON WORKS, LIMITED

SANDVIKEN, SWEDEN

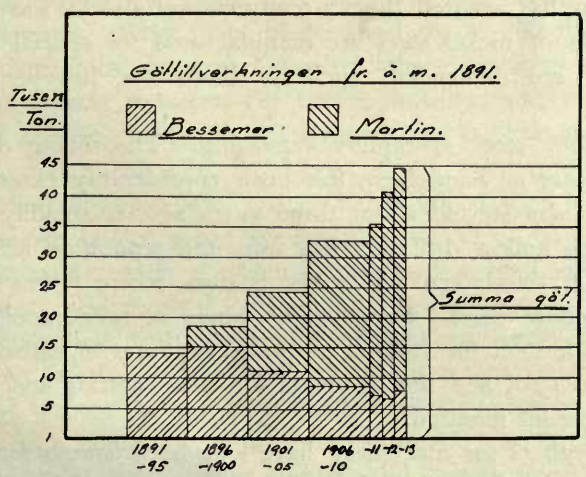
(SANDVIKENS JERNVERKS AKTIEBOLAG)

THE SANDVIKEN IRON WORKS are situated at Sandviken in the province of Gestrikland, some fifteen miles from Gefle at the railway-line Gefle—Falun. The Sandviken Works work exclusively for the production of iron and steel of high quality. The ores from which these superior products are made are taken from the Company's own mines belonging to the old renowned mines of Central Sweden; these ores are smelted on the spot, the sole fuel being charcoal. The making of steel and of the great variety of refined products, both hot-rolled and cold-rolled, manufactured from the steel, is thus based on the Company's own pig-iron. The cold-rolled products comprise such delicate and exacting wares as, for instance, watch-springs.

The ores are chiefly taken from mining fields famed for quality. When the Sandviken Works in the nineties of the last century took up the making of Martin steel, it was found that the latter, owing to its superior tenacity, was better adapted than Bessemer steel for such products where tenacity and ductility were of great importance.

Moreover, as Martin steel proved cheaper to make than Bessemer steel, a natural consequence was that the manufacture of Martin steel rapidly at the expense of the Bessemer process, as will be seen from a glance at the appended diagram.

Nevertheless the Bessemer process has held its own against the cheaper Martin process for certain purposes: for instance, where the chief desideratum is a high welding capacity, and in the manufacture of certain cutting edge tools. Thus the Sandviken Works make extensive use of the



THE INGOT PRODUCTION FROM 1891 INCLUSIVE.

BLAST FURNACES AND BESSEMER WORKS.

Bessemer method for-drill steel, stone cutting and forging implements, wrought-steel, cold rolled products of high temper and so forth.

As to the hot-rolled products manufactured by the Company, a great part of them consists of seamless boiler-tubes and hollow-blooms. These materials are worked up by the Company's customers, for instance, into cold-drawn tubes for bicycles, cold-drawn boiler tubes, hollow shafts, and so forth. The Sandviken tube materials have been put to extensive use by several large navies, in virtue of their pure quality, entailing a very unusual resistance to corrosion. This property, in conjunction with their ductility and the ease with which they are fitted up, has secured them a ready market also for locomotives and stationary boilers. Tube materials of nickel steel are manufactured for special purposes, where great strength and elasticity are demanded, such as shafts for heavy motor-cars, ammunition waggons, and so forth.

The output of tool steel is rapidly increasing. The rolling of file steel, which has been carried on for years at Sandviken, has been considerably extended. The making of hollow drillsteel, which was started about three years ago, is steadily augmenting; and the quality of the Sandviken hollow drill-steel has won it a reputation all the world over. The solid drill-steel made at Sandviken still holds its own, where it has not been ousted from the market by the hollow steel. Many other kinds of rolled tool-steel are made at the Works, for instance, knife-steel for various purposes, scythe-steel, chisel-steel, steel for thread-cutting tools. The tilted steel and the hammers for stone cutting and forging purposes made at Sandviken call for special mention.

The Sandviken forgings for machinery have long been famous for their perfect precision to measurements. What the Sandviken forges are now particularly aiming at producing are

TUBE ROLLING MILLS.

forgings of high physical qualities. They have in recent years been applied to extensive use for crank shafts and other movable parts for explosion motors, as well as for modern saw frames, piston rods for steam engines and steam hammers, and so forth. Smaller machine parts, particularly when made of nickel-steel, are delivered heat-treated when required. In this connection it should be mentioned that nickel steels and chrome-nickel steels of the highest quality are made for motor-cars, and have secured a good market.

A considerable part of the Company's output consists of cold-rolled or cold-drawn products. Cold-rolled band-steel in widths ranging up to 400 millimeters (about 16 inches) has been put to use mainly for band saws for wood and metal, metal hack saw blades, ordinary saw blades, springs, safety razor blades, and so on. Medium hard cold-rolled steel is used for various mechanical parts in industries where precision of finish is specially demanded, such as the bicycle industry, the textile industry, and so forth. Extra soft cold rolled material finds a market chiefly for deep stampings, the manufacture of flexible tubing, and the like. As to cold rolled wire, Sandviken is still the biggest producer in the world of grooved umbrella wire, or »paragon». Round cold-drawn wire is manufactured for spiral springs, tone springs, fish hooks, etc. Special attention must be directed to the so called »silver steel», the distinctive mark of which is the hard, brightly polished surface, and the trueness to measurements. Silver steel is used for fine boring tools, such as burrs for dental engines, fine and coarse spiral drills, for shafts for small machinery, and so forth. The manufacture of watch-spring steel has increased greatly in recent years: it now also comprises the making of finished springs for the Scandinavian watch industry.

The Sandviken saw blades enjoy an excellent market both in the home country and abroad. They have acquired a reputation and secured a very good market even in America.

Cold rolled steel bands for transport purposes go to swell the catalogue of finished wares produced at Sandviken. Steel bands are used with advantage in lieu of the more expensive rubber bands for various kinds of goods, such as coal, wood charcoal, wood chips, iron- ore in small pieces and in the form of concentrates, for cement clinker, molasses, and so on. The Sandviken steel bands have likewise been coming more and more into use, in place of beltings, for the transmission of power.

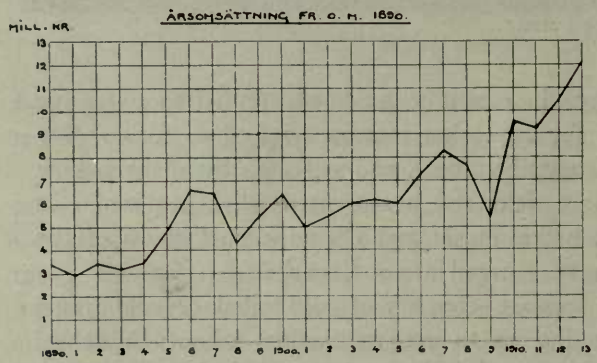
This cursory review will serve to give the reader some slight indication of the great variety of manufactures successfully undertaken at Sandviken.

The plant for this production comprises at present (1914): *Blast furnaces and Steel Works:* 4 blast furnaces, 2 Bessemer furnaces, 7 Martin furnaces.

Hot rolling Mills and Forges: 1 ingot rolling mill, 2 rolling mills for finished bars, 1 rolling mill for hollow drill-steel, 2 band rolling mills, 1 wire rolling mill, 4 tube rolling mills, workshop for the galvanisation and finishing of pipes, 12 steam hammers weighing up to 15 tons.

Cold-rolling and Wire-drawing mills, with tempering plant, saw blade and spring factories.

For building and repairing purposes there is a large mechanical workshop, foundry, joinery workshops, blacksmiths' and locksmiths' workshops, etc.



MILLION KRONOR. ANNUAL OUTPUT FROM 1890 INCLUSIVE.

For testing purposes, there is, besides the chemical laboratory, a testing institute with the most modern appliances for physical tests, electric laboratory furnaces, and a complete microscopic equipment.

As to motive power, the Company disposes of about 9,000 h.p. of which a part is taken from the river Dalelfven about 34 miles away from the Works. The Company purchased in 1908 the Lanforsen Waterfalls situated in the same river which are estimated to yield about 17,000 turbine h.p. These Falls have however shared the same fate as many others in Sweden: owing to the intervention of the State as claimant, they have hitherto had to lie idle.

The share capital of the Company is at present 6 million kronor. Besides plants and dwellings which more immediately belong to the Iron Works, the Company owns a ground totalling about 13,000 acres of which about 12,000 acres consist of forests.

In order to secure charcoal for the blast furnaces, the Company has partaken in the foundation of, and is still the principal shareholder in, a couple of the largest charcoal Companies in the country.

The annual output from the Works during the last 25 years will be seen from the accompanying diagram. The export for 1913 figured out at 75 % of the total sales. This figure was still higher at the time where the manufacturing industry of Sweden was as yet comparatively undeveloped.

The full working strength is about 2,400 hands. In order to provide dwelling facili-

SANATORIUM FOR WORKMEN.

ties, the Company has set up a »Workmen's City» where about 4,600 persons live in houses belonging to the Company. The Company, moreover, has allotted considerable areas for dwellings on the one-house-to-a-family system. These grounds have about a hundred dwellings built on them, and in the course of the present year some forty more will be erected.

Moreover, some 250 dwellings belonging to workmen and artisans are erected on plots of ground detached from peasants' farms.

The one-family houses are as a rule, surrounded by gardens, each having an area of about 600—1,400 square meters.

The Sandviken Works, with immediate surroundings, have at present a population of over 9,000 souls. The Works physician has at his disposal a well equipped hospital, with a general clinical surgery and 12 beds. In 1897 the Company erected an »up-to-date» hot-baths establishment comprising, besides hot baths, also a swimming bath and two commodious steam-bath rooms. During a single day, as many as 1,120 hot-steam baths and 117 hot-water baths have been given. A sanatorium for consumptive workmen and workmen's family members was opened there in 1905 in the vicinity of the Works, with beds for 20 patients. At this sanatorium workmen to the Company are treated free of charge, members of their families paying 50 öre (13 cents) a day. Strangers are received, as accommodation permits, at the cost rate of 2 kronor 75 öre (about 75 cents) a day. The School of Cookery, which was opened in 1906, is arranged with the express view of providing young girls of the working classes with adequate instruction in the cooking of plain, cheap, and nourishing food suitable for and accommodated to the purse of a working-man's family. For girls from the Works, instruction is free of charge. Reading rooms and a lending library housed in a special building are much appreciated, and frequented. The reading room is open to the

[15] *Sweden, San Fransisco 1915.*

SCHOOL OF COOKERY.

THE GREAT WASHING HALL.

general public free of charge. The use of the lending library is subject to the small fee of 25 öre (7 cents) a quarter. — Assembly Rooms were erected by the Company in 1908 to provide premises for meetings of all descriptions, lectures, theatrical entertainments, and musical festivals. The Assembly Rooms comprise a large hall for 650 persons, (containing a stage), a smaller hall with cosy rooms for festivals and parties, and a hotel department, where bedrooms and plain board are obtainable. At the close of 1913 the Company opened a big washing establishment arranged on the most »up-to-date» lines. It is built of reinforced concrete, and in three storeys. Places in the washing hall are let out by the hour to the public. It has been found that the washing for a workman's home can be got through at this establishment in about a quarter of the time taken by it in the old primitive wash-houses, and that too for a smaller pecuniary outlay than in the former.

The Sandviken Iron Works were founded in 1862 by Consul G. F. Göransson, through the formation of the Högbo Steel and Iron Works Co. This was after Göransson had succeeded, in 1858 by the display of enormous energy, in bringing to a satisfactory solution the problem which Henry Bessemer had left imperfectly developed in his invention (patented in 1855) for making steel direct from smelted pig iron. The Sandviken plant consisted at first of a blast furnace, Bessemer works, steam hammers, and a rolling mill for railway tires. Then steadily, step by step, the development proceeded. New products were evolved from time to time in response to new requirements. In order to cope with the ever-increasing demands for the Company's products, additional blast furnaces, steel works, rolling-mills, and other works have been continually erected.

This successful development of the Sandviken Works is to be ascribed in the first place to the vigour and foresight with which the affairs of the Company were administered during the lifetime of the founder and his son. Consul Göransson was an adept in the art of gathering about him a steadily increasing staff of capable assistants, both officials and workmen; from the end of the sixties he was ably seconded by his eldest son, Henrik Göransson, who acted as Managing Director of the Company until his death in 1910. His eminent capacities as a leader and a man of business, which redounded in abundant measure to the benefit of the Company, have certainly been a governing factor in the rapid and successful development of the Company during the first fifty years of its existence.

CARL SETTERWALL & Co. A.-B.

STOCKHOLM, SWEDEN

CABLE-ADDRESS: »SETTERWALLS, STOCKHOLM».

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Speciality:

IRON FOR MELTING, viz. HIGHEST GRADE CHARCOAL PIG IRON for ordnance and other purposes, made from the World's most famous ore, the DANNEMORA and from other well-known ores,

WHITE CHARCOAL PIG IRON in thin pigs for carbonising,

MELTING BARS (with lowest possible phosphorus and sulphur) viz. WALLON BARS (the highest quality in existence for CRUCIBLE MELTING), HAMMERED AND ROLLED SOUND LANCASHIRE BARS as well as ROUGH BARS, all from DANNEMORA and other districts,

CHARCOAL BAR IRON for forging and other purposes (»Norway Iron») of the best brands in the market,

CHARCOAL IRON BLOOMS,

SWEDISH STEEL in Ingots, Billets and Bars, Hammered and Rolled, of Crucible, Martin and Bessemer to any practical analysis,

SWEDISH SOLID STEEL ANVILS, made from one piece of Best Swedish Cast Steel,

SWEDISH IRON AND STEEL CHAIN (as well as COMPOUND CHAIN) etc.

THE GENUINE SIEVERT APPARATUSES

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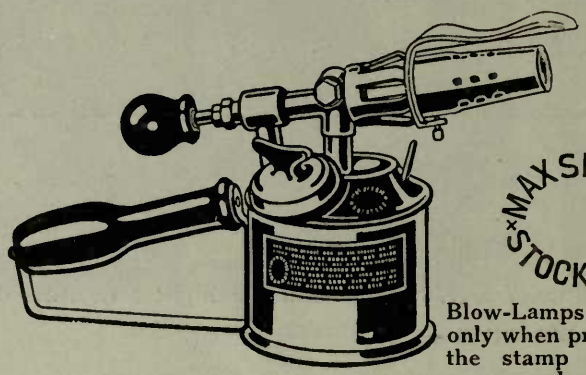

MAX SIEVERT STOCKHOLM

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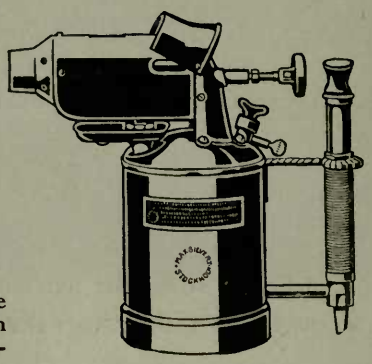

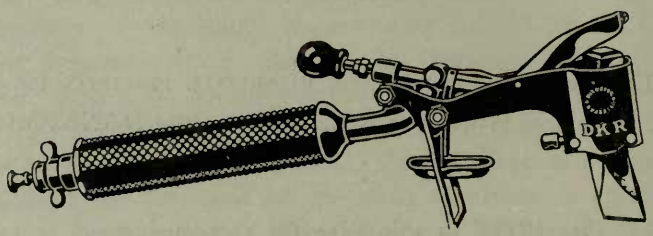

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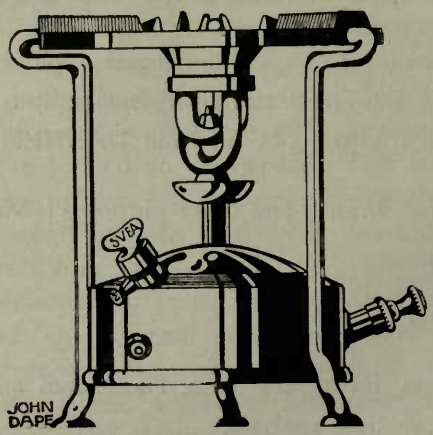

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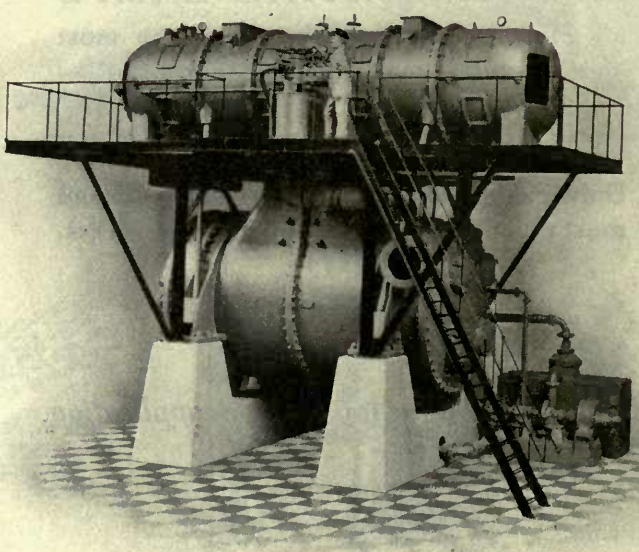

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Unequalled in STEAM ECONOMY, RELIABILITY, SAVING OF SPACE.
At a recent test of a 1,400 K. W. plant made at our Finspong factory, the RECORD FIGURE of 5,11 kg. (= 11,26 lbs.) of steam per K. W. hour was obtained. — Write for particulars.

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THE HISTORY OF OUR COMPANY
IS THE HISTORY OF THE MOST IMPORTANT OF RECENT DEVELOPMENTS IN STEAM TURBINES

OUR mother company Aktiebolaget Ljungströms Ångturbin, Finspong, Sweden, holders of the patents all over the world, was founded in 1908 with a view to acquire the patents rights for the new double rotation reaction turbine, invented and worked out by Mr. Birger Ljungström in co-operation with his brother, Mr. Frederic Ljungström. After several years of research work, the first experimental plant was built, and immediately established its superiority over all other turbines especially by reducing the steam consumption to figures never before accomplished. After the reliability of the design had been fully evidenced by a 1,000 K. W. unit, installed at the Willesden Power Station in London, which has placed a repeat order for a 7,000 K. W. plant, manufacturing companies on licence terms were rapidly established in several European countries.

Among these companies, we were the first manufacturing company. After having acquired the well-known gun factories at Finspong as a going concern, we have, retaining the best traditions as to accuracy of work and excellence of material, already prevailing in connection with the old factories, started the manufacture of the Ljungström turbine with perfect success. The total capacity of Ljungström turbines already supplied or in course of construction now approaches 100,000 H. P.

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SVENSKA TURBINFABRIKS AKTIEBOLAGET LJUNGSTRÖM
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THE NEW STATHMOS COMPANY LTD.

(NYA AKTIEBOLAGET STATHMOS)

NYNÄSHAMN — SWEDEN

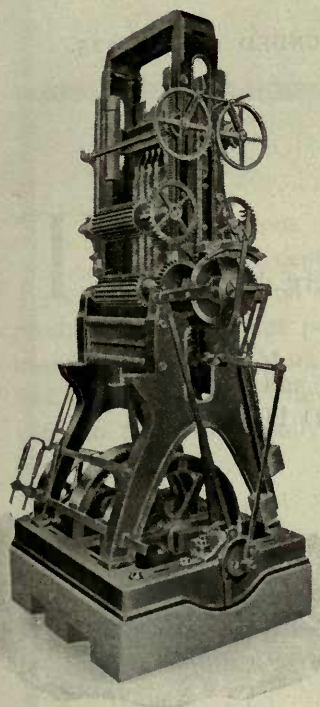
(NEAR STOCKHOLM).

THIS Company, which is one of the youngest, but most vigorous and flourishing commercial companies in Sweden, has two separate departments, the one for weighing-machines and scales, and the other for sawing machines.

The scales and weighing machine department, established in 1904, turns out all kinds of scales from the most delicate type up to the largest railway weighing-machines for loads up to 100 tons and more. One of the specialities that the company has so successfully introduced onto the world's market is the dial scale with the so-called Stathmos apparatus, which consists of balances rolling free of friction and hung up on steel bands. This ingenious invention has rendered it possible to make durable and reliable quick-weighing scales for which there is an almost unlimited market. Stathmos scales are used by Post offices, shops, and at railway stations and are fast becoming more and more popular on account of their lightness and quick-weighing qualities. Muddling with loose weights is entirely dispensed with, likewise the troubles of shifting sliding weights, as the weight is instantly indicated on the dial.

The Stathmos company is well known as manufacturers of weighing machines for railway purposes without breaking the connection of the rails. It is thus possible to place them even where there is much traffic as the rails run over the frame surrounding the weighing bridge without being disconnected. When it is desired to make use of the weighing machine the bridge is drawn up, upon

which the mounting rails at both ends of the machine are swung out in such a manner as to catch the flanges of the wheels and lead them on to the bridge rails. These weighing machines are generally urnished with a dial apparatus as well as a sliding poise beam so as to render it possible to take the weight of a whole train when in motion and also to enable the weighing of single trucks with greatest accuracy. The beams are as a rule fitted with a ticket printing apparatus.



The process of weighing quickly while the train is in motion is effected in the following way: After the engine has passed the weighing-machine, the latter is drawn up into weighing position, after which the train is allowed to pass over the machine with a speed of 0,5—1,0 meters per second when the weight of each truck or waggon in turn is registered. These machines are very much used by the Swedish railways and those of other countries.

o o o

Realising the need of effective, easily managed sawing machines for the saw-millindustry in the North of Sweden the company established a special department for their manufacture. During the few years that this department has been running it has met with extraordinary success and experienced a remarkable development. A number of saw-mills, both large and small, have been erected on the company's system in various parts of Sweden and abroad.

Frame-saws are made to work at high speed and with thin blades so that the greatest turn-out of wood is obtained at the lowest possible cost. These machines are also fitted with a new and ingenious feeding device, by which the full cutting capacity of the blades is utilised. An automatic conveyor. has been constructed to carry the timbers to the frame which is the means of saving a great deal of time. The mill-hand is saved the trouble of choosing a log of suitable dimensions as there is always one ready at hand.

The edging, catching and splitting of the timber, as also the conversion of the waste into box boards, staves, laths, rails etc., is done by modern machines designed to reduce labour, which, of course, means a considerable increase of profit for the mill-owners.

o o o

The Stathmos factories are equipped with every modern convenience and the work turned out has everywhere received the fullest praise for the care bestowed upon it and its durability. The ever increasing confidence enjoyed by the firm is the most eloquent proof that its work is based upon sound principles.

STORA KOPPARBERGS BERGSLAGS AKTIEBOLAG

FALUN — SWEDEN

OLDEST JOINT STOCK COMPANY IN THE WORLD. FOUNDED ABOUT 1225.

Manufacturers and Exporters of:

ROLLED and HAMMERED IRON and STEEL of every description and 50 % FERRO SILICON.

SAWN and PLANED WOOD GOODS.

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All-steel ANVILS and VICES &c.

WALLOON and LANCASHIRE IRON.

STORFORS BRUKS AKTIEBOLAG

STORFORS — SWEDEN.

THE possessions of the Storfors Bruks Aktiebolag are situated in the province of Wermland in central Sweden.

Their total extension is over 70,000 acres and from their own forests the company produces an important part of all the charcoal upon which its Iron and Steel manufacture is based. Here at the Mora—Venern Railroad both its principal Iron Works, Nykroppa and Storfors, are situated. These belonged to the Swedish Government until 1714, and then until 1865 to the noble family of Linroth, who sold it to the newly established Company, Storfors Bruks Aktiebolag.

During the past years this company has successfully developed the Iron and Steelworks as shown by these figures:

		1865	1913
Output of pig-iron	tons	3,359	12,967
Output of ingots	»	2,646	29,402
Consumption of charcoal	cbm.	41,920	74,400
Wages	Kr.	59,449: —	1,551,354: —
Sales amount	»	537,414: —	4,553,343: —

The works consist of Blast Furnaces, Bessemer and Open Hearth plant, Rolling mills, Steam Forge and Tube mills.

The Iron and Steel products of the company are exclusively manufactured of charcoal pig-iron from the excellent ores of Persberg, Långban, Finnmossen and Tuolluvara of which mining fields the Storfors Co. is a partner.

The principal products are: Bessemer- and Open Hearth steel of first class quality in form of ingots, blooms, billets, bars and rods;

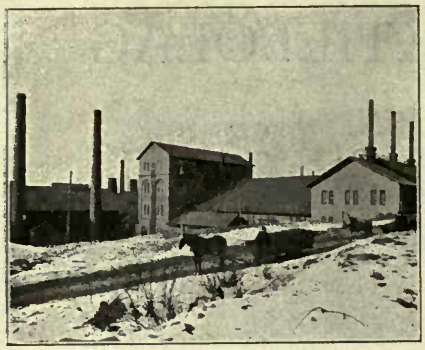
Forged steel products- of different kinds as miners' drills, steel balls, crankshafts etc.;

Weldless steel tubes, hot-finished and cold-drawn;

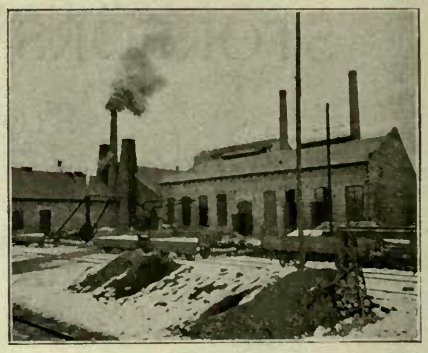
Hollow drill-steel;

THE NYKROPPA WORKS.

THE STORFORS WORKS.



NYKROPPA BLAST EURNACES.

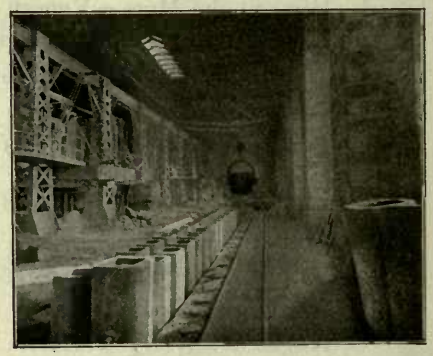


BESSEMER- AND OPEN HEARTH PLANT.

Fittings and tube work for engineering purposes.

The bessemer steel is of a notably high quality and especially used for edge-tools. The open hearth steel in soft and hard qualities is also much appreciated on account of its uniformity and reliability. — The tube manufacture principally comprises boiler tubes, especially for marine-boilers, for which the highest pretensions as to quality and workmanship are stipulated.

TUBE WORKS.



OPEN HEARTHS.

Further tubes are made for locomotives, bicycles, motor-cars, aëroplanes, hydraulic and engineering purposes etc.

The main object of the company is the production of high quality goods and great importance is attached to having the chemical and physical laboratories and inspection rooms connected with the works in a first class condition.

All the works are driven by water-power from the company's own waterfalls, principally transmitted by electricity. The total amount of this water-power is about 4,300 H. P.

INSPECTION ROOM FOR TUBES.

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SWEDISH TRADING COMPANY

STOCKHOLM, SWEDEN.

SUCCESSORS TO N. M. HÖGLUND'S SONS & CO.

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BEST SWEDISH CHARCOAL LANCASHIRE IRON ("Norway Iron") in assorted sizes, in Bars, Bundles and Coils, Strips, et cet.

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Rough, Rolled finished or Hammered LANCASHIRE IRON *for Crucible steel melting,* WALLOON IRON, CHARCOAL PIG IRON for high class Siemens or Bessemer steel making, WHITE PIG IRON for carbonizing.

SWEDISH BESSEMER and SIEMENS MARTIN STEEL in all Carbons, in ingots, hammered or rolled billets and bars, Steel coils, rolled or drawn wire, Steel for ROCK DRILLS, SOLID and HOLLOW, Steel plates for Circular Saws, et cet.

CHAIN, Anvils, Wire rope, et cet.

WOOD PULP, *Paper, Paper-board,* et cet.

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Manufacturers of all kinds of pressed steel goods, such as:

ENAMELLED WARE in variety.

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SPIRIT, OIL AND BENZINE CONTAINERS, pressed and welded.

PRESSED RAILWAY MATERIALS, such as BOGEI FRAMES, BUFFERS, Oil Boxes, etc.

WAR MATERIAL such as SHRAPNEL SHELLS, Explosive Projectiles, Mines, Cartridge Casings, etc. etc.

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Awarded Prizes in Paris, Chicago and Stockholm.

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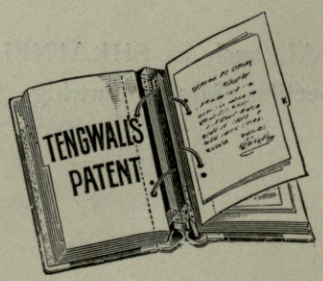
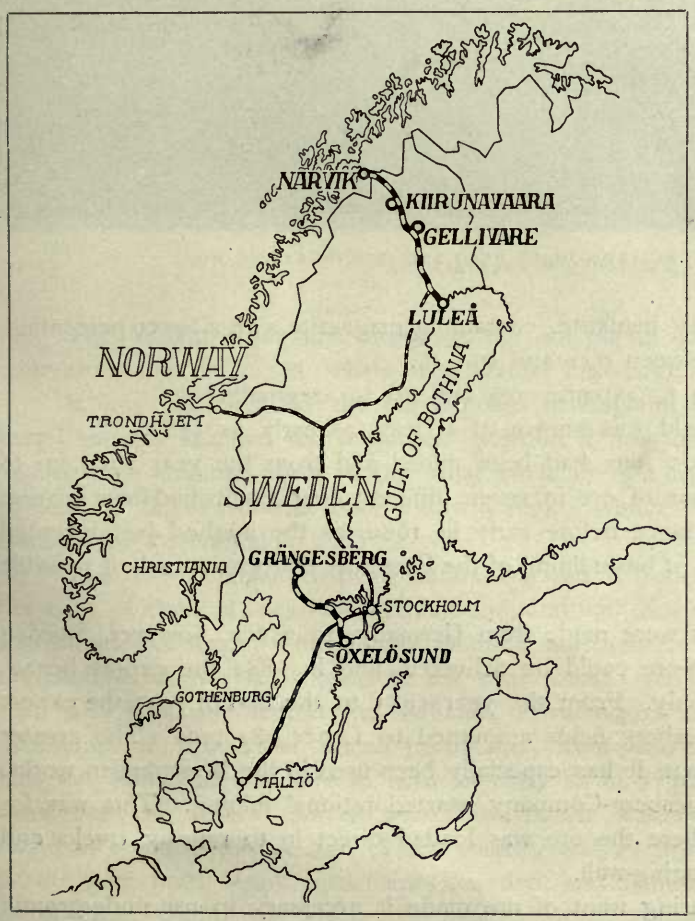
THE STRONGEST AND MOST HANDY IN THE WORLD.



TRAFIKAKTIEBOLAGET GRÄNGESBERG—OXELÖSUND.
LUOSSAVAARA—KIIRUNAVAARA AKTIEBOLAG.
REDERIAKTIEBOLAGET LULEÅ—OFOTEN.

HEAD OFFICES: STOCKHOLM, SWEDEN.

TRAFIKAKTIEBOLAGET GRÄNGESBERG—OXELÖSUND generally called The Grängesberg-Company is the greatest Iron-Ore Company in Sweden. It is the principal shareholder of the mines in Grängesberg and holds half the number of shares of the Luossavaara—Kiirunavaara Aktiebolag. Besides that the Company holds all the shares of the Rederiaktiebolaget Luleå—Ofoten, which transports the iron-ore from the exporting harbours to the harbours of the consuming countries, Germany, England, France, Belgium, The United States of America and Sweden.



The Grängesberg Company started in the year 1883 and carried on a constantly increasing iron-ore export. In the year 1903 the Company bought the majority of shares of the two great mining-fields of Gellivare and Kirunavaara in Lapland. In the year 1908 an agreement was made with the Swedish Government, which is the owner of the railways from the last mentioned mining-fields. Through this agreement the States became shareholders in the mining-fields of Lapland, and the Company obtained a freight rate until the end of the year 1932, when the Government has the right to buy the shares of the Grängesberg-Company in the mining-fields of Lapland.

The Grängesberg mining-field is situated principally in the province of Dalecarlia, about 230 kilometers from Stockholm. The entire field has a length of 4,500 metres and a breadth of 400 metres.

In this dominion there are a great many ore bodies varying very

much in extent. The total ore-area of this field is about 94,000 square metres, of which the Grängesberg-Company is the owner of 54,000 square metres.

Through extensive tunneling it is known, that the greatest ore-body at a depth of 500 metres has about the same area as at the surface. The quantity of ore at this depth has, in the deposits belonging to the Grängesberg-Company, been calculated to about 100 million tons, and there is every reason to suppose, that the quantities below that level are much greater.

The ore, which is found in Grängesberg, is of two different kinds viz. »apatite-ore», which is a fine grained magnetite, generally containing 62 % iron and 0,8 to 1 % phosphorus

GRÄNGESBERG IRON-MINES. MÜLLER'S SHAFT HEAD AND CONCENTRATING MILL.

and »segmalm», which is a thin slaty hematite, containing magnetite with a lower percentage of phopshorus, generally varying between 0,07 and 0,30 %.

The total ore area contains 84 % »apatite-ore» and 16 % »segmalm».

The ore of the Grängesberg field was known of at least as early as 1584.

Previous to 1783 only 250,000 tons had been mined and from the year 1783 up to the close of 1881 only 2,231,987 tons of ore in seven different ore deposits had been broken. This district was of no great importance before early in 1880, as the method just invented by Thomas and Gilchrist, by means of basic lining of the Bessemer converter, made it possible to dephosphorate iron.

As early as in 1881 inquiries were made from Germany, to which, however, Sweden had given rise, whether Grängesberg-ore could be delivered, and in 1882 the export began, at first, however, on a small scale only. From the year 1883 to the end of 1913 the export and delivery of ore from the Grängesberg fields amounted to 12,760,082 tons. The greater part has been sent to Germany, where it has especially been used in the Westphalian works.

In the year 1883 the Grängesberg-Company started rational mining. This was for many years done in open stopes where the ore was loaded direct in to railway trucks and later on hoisted in shafts in the hanging-wall.

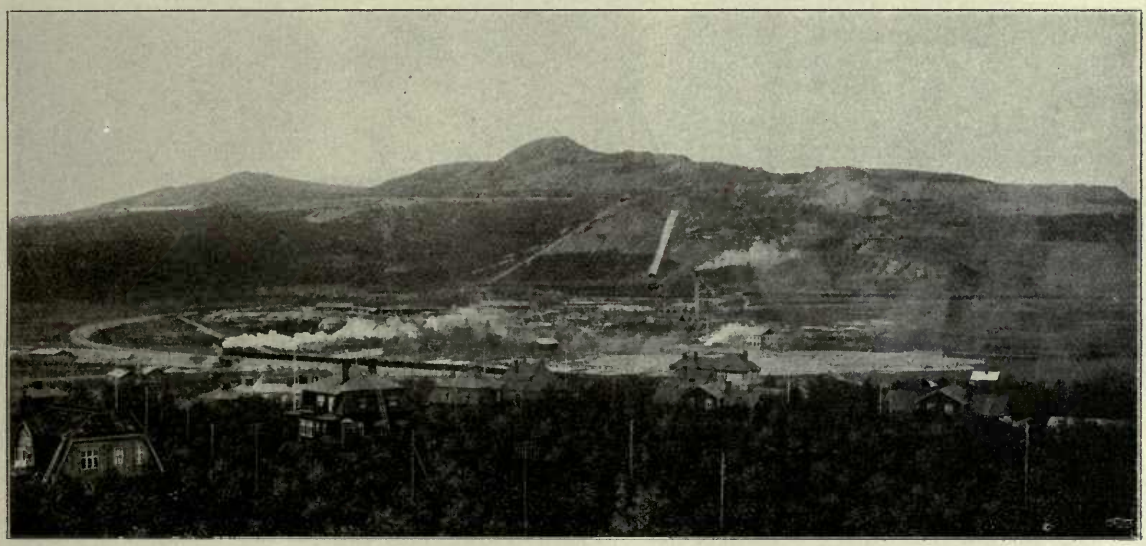
However, the constantly increasing want of ore made it necessary to use underground

mining and in 1897 a shaft was sunk to a depth of 150 metres, followed in 1898 by a second one with the same depth.

At the same time the underground mining was arranged after the system of stoping by shrinkage and at present most of the ore is mined in that way.

The drawn-off ore, which is mixed with rock, is put through cobbing plants and the fine goes through concentrating mills.

The power required for the mining is produced at four different water-power stations. Under ordinary circumstances at Grängesberg they deliver about 3,500 kilowatts alternating current.



KIIRUNAVAARA IRON-ORE MOUNTAIN.

The Mining Company transports the ore on its own railways to Oxelösund (253 kilometres) on the Baltic sea, where it is loaded into large ore steamers.

It was not until the the big deposits in Lapland had been acquired that the Grängesberg-Company reached the prominent position it now occupies in the mining industry. These deposits are situated north of the polar circle 17—22 degrees East of Greenwich and between 67 and 68 degrees North, thus within a region which, on account of its cold climate, is not suitable for cultivation.

The two deposits Gellivare Malmberg and Kiirunavaara Malmberg are connected with the Gulf of Bothnia, near its northern end, and with Narvik on the Atlantic coast by a railway 480 kilometres long. The Gulf of Bothnia is frozen for about $6^1/_2$ months of the year, but the harbour at Narvik is open all the year round.

The great ore-deposits at Gellivare, Kiirunavaara and Luossavaara are mentioned at the beginning of 1700, but, in all probability, were discovered during the preceding century. Ore was mined at Gellivare at least as early as in 1736 when, for its utilization, iron-works were built at several places nearer the coast. Later on, 1797—1808, a great effort was made to colonize this section of the country and to produce a powerful iron-industry there. Roads were built, many settlements founded, and manufacturing industry was developed, but, all in vain.

The essential and direct obstacle to the exploitation of Lapland ores was, of course, the difficulty of transporting them to the coast, and it is of great interest to study the efforts made in the course of time to find out cheaper means of conveyance than by rein deer. Another reason for the failure was probably the high percentage of phosphorus in the ore.

GELLIVARE IRON-ORE MOUNTAIN. OPEN STOPES AT THE KING OSCAR MINE.

Most of the ore-deposits in Lapland show a certain simlarity to each other with regard to the quality of the ore and their geological relations, and can be said to form a group, fairly distinctive from the iron ore-fields of southern Sweden. As a rule the ores are connected with unmistakably eruptive, but often much altered rocks, quartz-porphyries, syenite-porphyries and fine-grained syenites and leptites, belonging to a younger division of the Archæan.

Particularly characteristic for most of the ores is their unusually high percentage of iron, in general a high percentage of phosphorus and an insignificant percentage of silicates. In the most important of the ores — those in Kiirunavaara, Luossavaara and Gellivare — the sum of iron oxides and apatite varies, as a rule, between 92 and 98 per cent; at Kiirunavaara it is usually between 92,5 and 98,5 per cent. It is evident that this circumstance increases the value of the ores, especially so long as they cannot be used, to any larger extent, for making iron in the vicinity of the mines.

The percentage of iron in the ores, that are now mined, is rarely less than 60 per cent, and occasionally amounts to 68—69 per cent, or still more. The percentage of phosphor is, as a rule, very high, varying between 0,6 and 3,5 per cent, or more; but ore is also produced with a guaranteed maximum percentage of phosphor of 0,6 and 0,3 and also an ore suitable for acid bessemer with a maximum percentage of 0,03 and 0,05. The percentage of sulphur in the Lapland ores rarely exceeds 0,05—0,08.

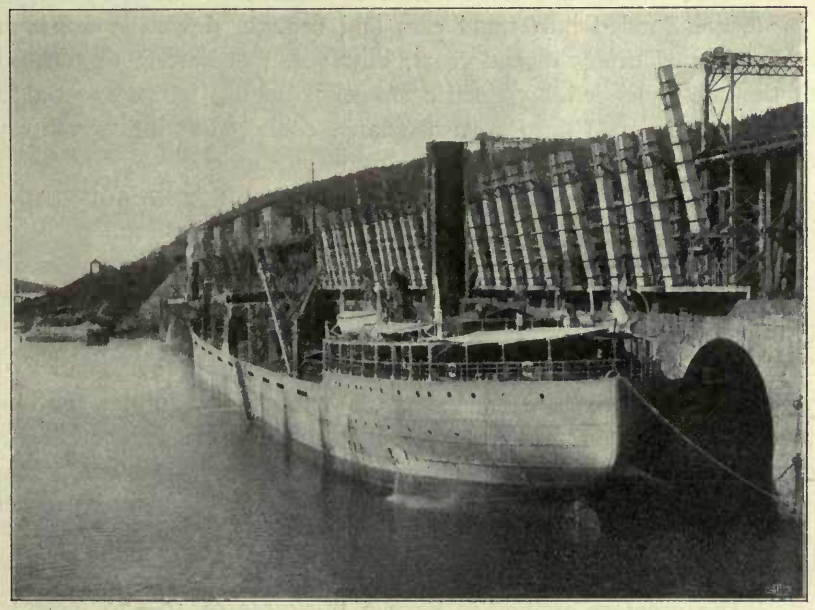
The ore-mountains KIIRUNAVAARA and LUOSSAVAARA rise to a considerable height on each side of a flat valley, through which the railway between the ports of Luleå and Narvik runs.

Kiirunavaara is a ridge running North and South about 3,5 kilometres and divided into a number of more or less isolated hills, of which the highest has been about 748 metres

above the level of the sea and 248 metres above the bed of the valley. The whole ridge consists of an almost continuous body of iron ore, also extending northward in the boggy ground and in the neighbouring lake, so that the whole deposit has a length of more than 5 kilometres. In the ridge itself the ore has either been altogether exposed or covered only by a comparatively thin layer of moraine.

The ore is surrounded by eruptive rocks of a somewhat different nature in the foot-wall and in the hanging-wall. The eastern slope of the mountain, thus the hanging wall, consists of porphyries and the foot-walls of grey or brownish-grey syenite porphyries. At a distance of about 400—500 metres from the ore, it changes to a distinctly grained syenite.

The phosphor in the ore occurs in the most varying proportions. In some parts of the ore-body there are only some hundreths of a per cent, in others it may rise to 4 or 5 per cent or more, but in any case the ore is so uniform that with the knowledge of the percentage of phosphorus, one can, with considerable certainty, calculate the percentage of iron and vice versa. Sometimes the phosphoric mineral, apatite, is so finely disseminated in the magnetite, that it cannot be discovered without the aid of a microscope, though the ore contains up to 5 per cent phosphor, sometimes it is found as smaller grains, as fine veins or fillings of cracks, or as irregularly formed drums and, in certain cases, as bed-like masses up to 0,3 metres in width and 10 or 15 metres in length. Broadly speaking, there is a certain regularity in the occurrence of apatite, but in each separate part of the field the changes are so considerable and rapid, that the ore cannot be sorted in the same manner as at other mines. In order to produce commercial qualities with a sufficiently uniform composition, it has been found necessary to use *mixing* instead of *sorting*, and such a system has been carried out very successfully.



THE ORE-LOADING PIER AT NARVIK.

Kiirunavaara shows peculiarities which distinguish it from most other deposits. The ore-body itself is almost entirely devoid of rock intrusions, a circumstance which, of course, very favourably influences the mining.

From a commercial point of view, and with principal regard to the percentage of phosphor, the ore is at present classified as follows:

A -ore.....	maximum	0,05	per	cent	P,	about	69—70	per	cent	Fe.
C^{I} -ore.....	»	0,3	»	»	»	»	67—68	»	»	»
C^{II}-ore.....	»	0,8	»	»	»	»	66	»	»	»

D -ore..... between 0,8 and 2,0 per cent P, average about 62 per cent Fe.
G -ore..... » 2,0 » 4,5 » » » » » 58 » » »

In the mountain ridge, about 3,000 metres long, the boundaries of the ore-body are very well known; its horizontal width is, on an average, 96 metres and the thickness, at right angles to hanging- and foot-wall, 78 metres. The maximum thickness has been found in a cross section through the hill Geologen, where the horizontal width is 196 metres and the thickness about 164 metres.

Bared or otherwise well known ore, between the railway at the northern end of the mountain and the southern end has an area of ..... 329,000 m²

Other parts of the deposit, known chiefly by magnetic survey and diamond drillings, about ..... 107,000 m²

Total about 436,000 m²

In order to obtain information as to the quantity and quality of the ore a number of diamond drill holes have been sunk and several of these holes have given very valuable information with respect to the dip and depth of the ore body.

The result of the drillings justifies the conclusion that the ore continues to a very great depth and this assumption has been very strongly confirmed by an extensive magnetic survey.

It has been estimated that Kiirunavaara contains about 740,000,000 tons of ore.

The mining in Kiirunavaara is carried out in open stopes generally 20 metres high. The ore is loaded into small cars and brought down the stopes of the mountain by a number of inclines. Durung recent years, however, this system of transport has been changed. Most of the ore is loaded by electric shovels; the big lumps are reduced in size by giant crushers and then dumped into vertical shafts, coming out into a railway tunnel at the foot of the mountain, where it is loaded into railway trucks.

GELLIVARE MALMBERG or the GELLIVARE IRON-MOUNTAIN is situated 100 km. South of Kiruna.

The mountain principally consists of a red leptite, intersected by large and small dikes of granite. The ore-deposits occur as several complexes of lenses, crossed by numerous granite dikes.

The most important of these ore-complexes is the so called »Stora malmen» (the big ore) which has a length of about 4,500 metres, and in the continuation of these big deposits there are both on the Eastern and the Western slopes of the mountain larger and smaller collections of ore-lenses within districts, each of which has a length of about 1,500 metres.

In the southernmost part of the mountain, there are also detached ore-complexes. One of these is the so called »Kaptenslagret» with a length of over 1,000 metres. Ore is found that contains comparatively little phosphor.

The greatest ore-bodies have a thickness of 40—70 metres and in some cases as much as 100 metres.

As the thickness and length of the different bodies or lenses varies considerably their ore-area also changes in a like degree, or from 20—25,000 m² to some hundred m² or still less.

In mining the ore is classified as to its percentage of phosphor in the following way:

C^{I} -ore containing max. ..... 0,35 per cent P
C^{II}-ore » » ..... 0,80 » » »
D -ore min..... ..... 0,80 » » »

The mining in Gellivare Iron-Mountain has hitherto reached only a comparatively inconsiderable depth, at the most 120 metres below the surface, but by a larger number of diamond drill holes, some of which have been sunk to about 400 to 500 metres below the surface, it has been proved that the ore extends very much deeper.

Taking into consideration all that is known of the extent of the deposits at the greatest depths under the surface at present reached, it has been calculated that to the 500 m. level there are at least 240,000,000 tons and of course very great quantities below that level.

Mining at Gellivare Malmberg is at present principally executed by shrinkage stoping and to a certain extent also by caving with sub-drifts. The ore is cobbed and dressed in new extensive concentrating plants.

The actual mining at Gellivare Malmberg started in 1892 and since then to the end of 1913 17,821,588 tons have been exported.

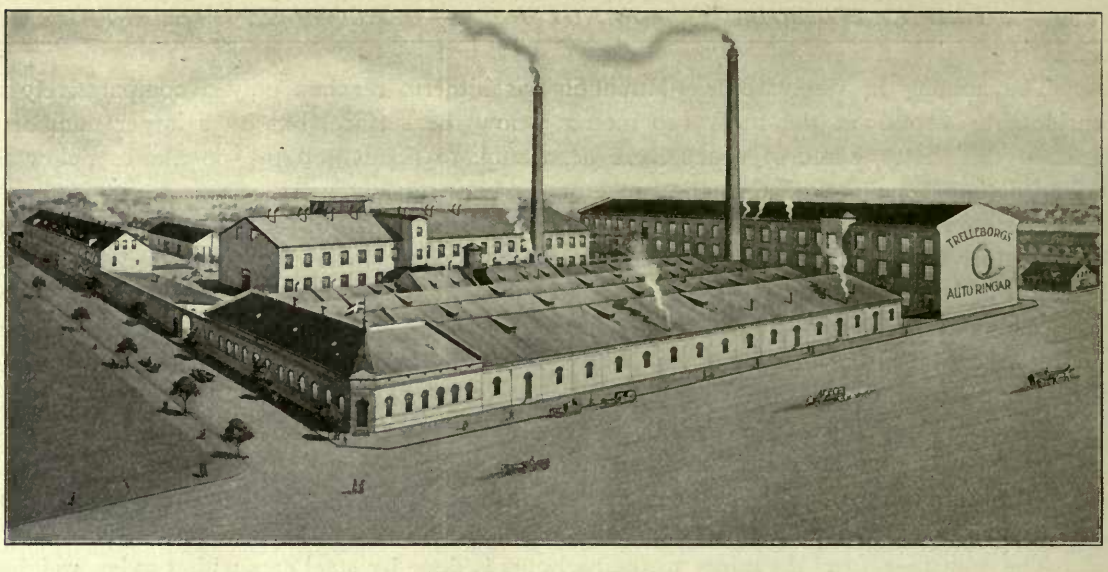
In Kiirunavaara mining has been carried on since 1903 and the export quantity is up to the end of 1913 19,900,267 tons.

The transport from the mines to the harbours is done by steel cars with 3 axles, weighing 11 tons and carrying 35 tons. From 1915 the ore trains from Kiirunavaara to the Norwegian frontier will be run by electric locomotives, the power produced at a large waterfall at Porjus, situated 55 km. from Gellivare.

Most of the iron ore from Gellivare is exported from Luleå on the Gulf of Bothnia and the Kiirunavaara ore from Narvik in Norway, where the Company has spent large sums to construct up-to-date and quick loading devices. The ore-pier at Narvik is built of granite, with wood and iron super-structure, and has a length of 345 metres, so that two steamers can easily load simultaneously. The contents of the ore-wagons are emptied from the quay through spouts direct into the vessel, by which means a loading capacity of 1,000 tons in $1^1/_2$ hour is reached.

The shipped ore is sampled at Narvik in a special sampling works, where $^1/_2$ per cent of every shipload is automatically crushed and divided.

In order to guard the interests of the ore traffic the Grängesberg Company has established its own shipping company, The Luleå—Ofoten Shipping Company, which owns 16 vessels with a total loading capacity of about 100,000 tons. The largest of these steamers load about 11,000 tons of ore, and have been specially equipped for the ore traffic, according to the so called pocket system, and with electrical or hydraulical cranes, whereby very rapid discharge of the ore can be effected. Such a vessel has discharged 10,700 tons of ore in 27 hours, with 24 hands. The corresponding figures for a modern vessel of the same capacity, but built in the ordinary way, are 60 hours and 160 hands.



THE TRELLEBORG WORKS.

TRELLEBORGS GUMMIFABRIKS A.-B.

(THE TRELLEBORG RUBBER WORKS CO. LTD)

TRELLEBORG, SWEDEN.

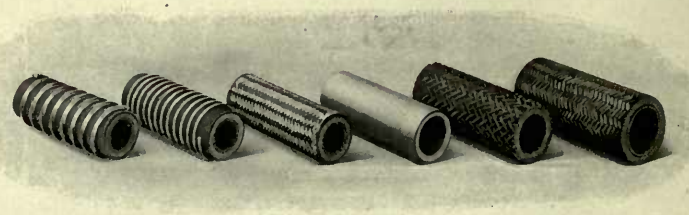
THE Trelleborg Rubber Works Co. Ltd. took over A. B. Velox (Velox Ltd.) in 1905 which had carried on the manufacture of rubber goods at Trelleborg since 1897.

At first the manufacture chiefly consisted of pneumatic tyres for bicycles and technical rubber goods such as spiral delivery hoses, water suction hoses, all kinds of packings, rubber valves, rubber beltings etc. etc. but, as the companies articles gradually became better known, the factory has had to be extended with the addition of a number of special departments so that at the present time in addition to the departments producing the afore-mentioned articles there are special shops for the manufacture of hoses, beltings, roller-covering, ebonite, motor-tyres, water-proofs, bed-sheeting etc.

All these departments are fitted with up-to-date equipment and the most modern mechanical arrangements so that the delivery of only first-class quality goods is ensured.

The Hose Department is housed in a building erected in 1913 and among other things it has at its disposal a shop which is no less than 350′ long and 50′ wide broad. The heaviest Hoses up to 100′ in length are made here.

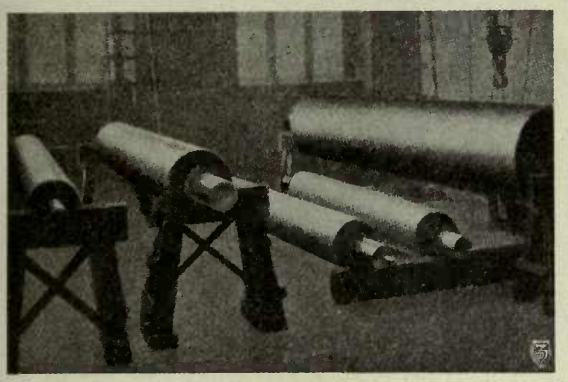
The Belt Department specializes in transport rubber belts of exceptionally reliable and endurable quality for the transport of ore, sulphite pulp, coal, beet etc.



TRELLEBORG RUBBER HOSES WITH VARIOUS KINDS OF COVERING.

The factory also turns out rubber driving belts in qualities well-known for their excellence and durability and also specially made belts with strengthened edges as protection against belt-fork wear.

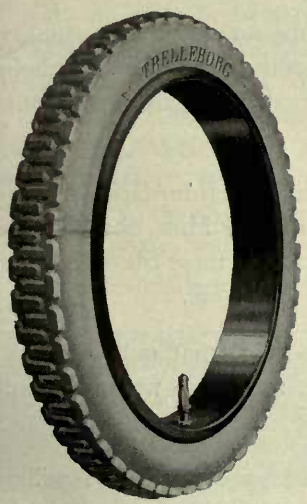
The Roller Covering Department is equipped with the most modern transport arrangements, which together with time-saving working methods enable the firm to enter into the keenest competition. In this shop cylinders are covered with rubber for use in paper, leather, and wool factories, as well as in spinneries, tanneries, joinery factories etc. etc.



INTERIOR OF ROLLER COVERING DEPARTMENT.

all in specially tested qualities that have been proved to be the most suitable for each industry.

The Ebonite Department turns out ebonite in all shapes and sizes; in sheets, rods and tubes for further preparation by customers, all kinds of insulating metal parts, accumulators, and moulded articles for various purposes.



TRELLEBORG PNEUMATIC MOTOR TYRES.

The Motor Tyre Department during the few years it has existed has made wonderful progress.

The pneumatic as well as the solid tyres turned out by the Trelleborg factory enjoy an excellent reputation in auto circles.

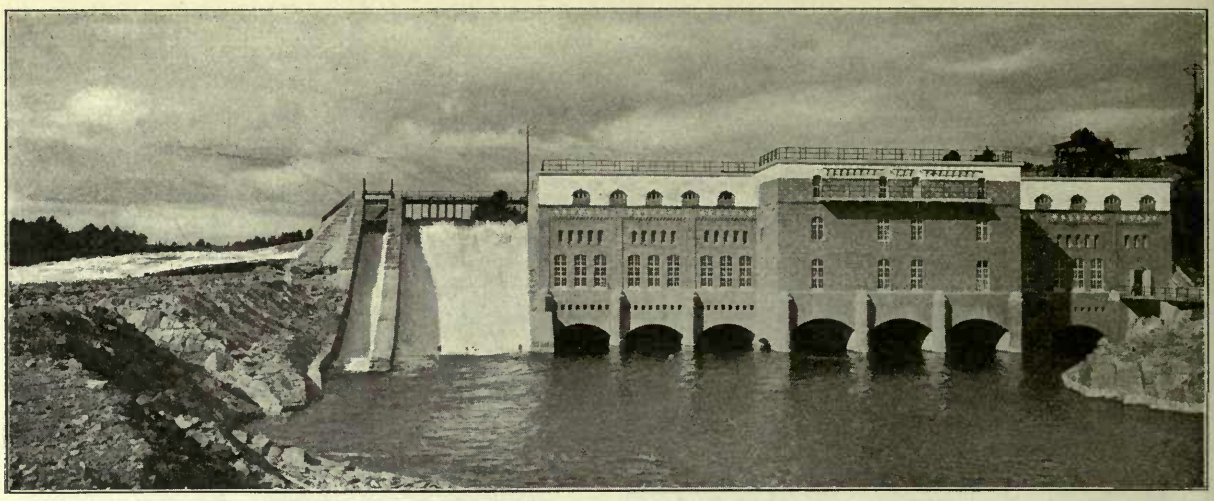
The tyres are especially made for Swedish roads and therefore good for country roads as well as for the streets of the town and, as far as reliability and durability are concerned, are equal to the very best production of foreign manufacture on the market.

The Spreading department delivers rubber cloths for hospital purposes and for water-proofs etc. etc.

The Trelleborg rubber factory's productions are exceptionally well known which to a great extent depends upon the efforts they have made to produce goods of the highest quality, realizing that in the long run customers will be best served thereby. This has been found to be true as repeat orders continually prove.

Besides a large staff the factory employs about 300 hands and as the requirements for rubber goods is continually on the increase the number of hands as well as the turn over is being increased every year.

Finally it may be mentioned that the Trelleborg Rubber Factory Co. Ltd. is the largest factory in Scandinavia for the manufacture of bicycle and motor car tyres and technical rubber goods.



THE FORSHULT POWER STATION (21,000 H. P).

UDDEHOLM LIMITED

(UDDEHOLMS AKTIEBOLAG)

UDDEHOLM, SWEDEN.

SWEDISH iron and steel is renowned in every part of the globe for its superior quality. The name »UDDEHOLM» even in Sweden stands for quality, and the Uddeholm Company can therefore justly claim to be in the foremost rank as regards the quality of its productions.

Situated in the West of Sweden, the company's works comprise 7 Blast furnaces, 5 Open Hearth furnaces, 2 Bessemer Converters, 9 Lancashire Hearths, 9 Rolling Mills, Steam Hammers, Cold Rolling Mills, Cold Drawing Plant, Carriage Spring Factory, Horse Shoe Nail and Wood Screw Factories, Saw Mills, Sulphite and Soda Wood Pulp Mills etc.

The excellence of the company's manufactures is due to the fact that only the very purest ores from own mines at Persberg, Taberg, Finnmossen etc. are used, while charcoal only is used for smelting.

The company possesses very extensive forests covering an area of about $^1/_2$ million acres, which furnish the raw material for the saw mills and wood pulp mills, as well as the charcoal for the smelting of the pig iron.

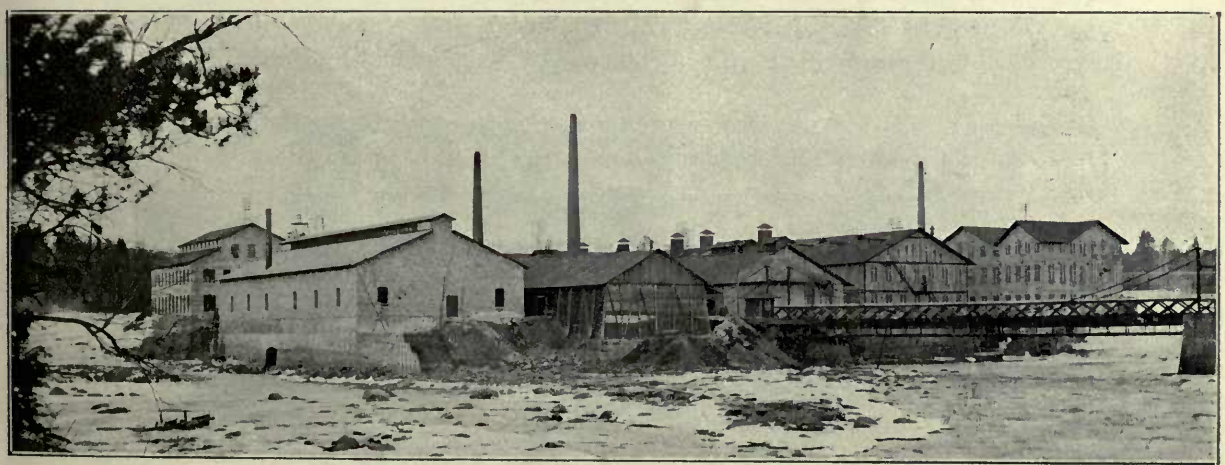
The motive power required is obtained from several water falls on the company's property and partly utilised direct in the works, partly distributed from power stations, of which one is shown in the above illustration.

The shipping port for the company's goods is Gothenburg, open the whole year round.

The principal specialities of interest to American buyers are the following:

THE HAGFORS IRON WORKS.

BILLETS, rolled and hammered, for Tool Steel, Mining Drill Steel, Wire Rods for rope drawing and high tensile wire.
ROUGH BARS of purest Lancashire iron (also called »Norway» iron).
Rolled and Hammered Steel Bars for various purposes.
ROLLED WIRE RODS for drawing Rope and Piano Wire.
TOOL STEEL in bars of very high quality.
MINING DRILL STEEL, all sizes and sections.
STEEL STRIPS, cold rolled, for Saws, Clock and Watch Springs, Steel Pens, Tape Measures, Safety Razors, Lace and Weaving Machines etc.
COLD DRAWN IRON AND STEEL, ANTIMAGNETIC IRON, dead soft.
HORSE SHOE NAILS.
SULPHITE WOOD PULP, easy bleaching,
SODA WOOD PULP, bleached,
} of extra high quality.
Correspondence invited.



COLD ROLLING MILLS, MUNKFORS.

AKTIEBOLAGET ÖSTERBY BRUK

(THE ÖSTERBY IRON WORKS LTD)

DANNEMORA, SWEDEN.

ÖSTERBY IRON AND STEEL WORK, founded in the year 1565, is situated in the middle of Sweden (Uppland) in the neighbourhood of the DANNEMORA mines, well-known for their excellent iron ore.

In these mines the company has a great share, and all the iron and steel, produced at Österby, is made of the Dannemora ore, which is a guarantee of its good quality.

Of the productions for export are to be observed:

PIGIRON, brand »AÖB», of a very excellent quality.

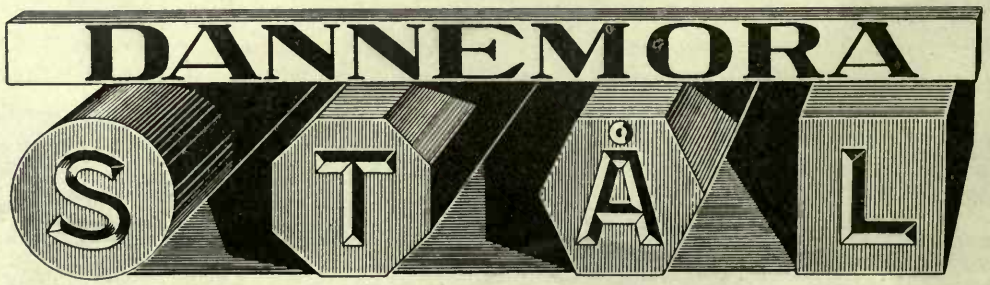
WALLOON BAR IRON, brand »OO» (double bullets), which for more than 200 years has been acknowledged as the most excellent steel-iron by all the principal steel manufacturers.

CRUCIBLE STEEL of a very high grade. It can undoubtedly in every way favourably compare with the best cast-steel in existence.

It is unrivalled as tool-steel, for stamps, cutters, chisels, dies, edge-tools, etc. and generally for all such purposes, where great toughness combined with hardness is required.

It can be heated and hardened a great number of times without thereby losing its »body».

The steel is made in many different sorts, as CARBON-STEEL (brands »DANNEMORA and »DORA»), CHROME-STEEL, NICKEL-STEEL, WOLFRAM-STEEL, MAGNÉT-STEEL a. s. o. Attention should especially be paid to the *high speed steel* brand »KEJSARSTÅL» (EMPIRE-STEEL), which with regard to its effect can enter successfully into competition with all other such steel of highest grade.



ELEKTRISKA PRÖVNINGSANSTALTEN
STOCKHOLM

MEKANISKA PRÖVNINGSANSTALTEN
SWEDEN

54 MALMSKILLNADSGATAN.

CONSULTING ENGINEERS IN THE ELECTRICAL, MECHANICAL, AND MINING MECHANICAL BRANCHES.

Proprietors: AXEL F. ENSTRÖM and CARL A. ROSSANDER.
Chief of Mech. Dep.: HOLGER A. SUNDBERG.
» » *Gothenburg Office:* P. FRENELL, 50 b Ö. Hamngat., Gothenburg.
» » *Malmö Office:* L. BOHLIN, 1 Mästernilsgat., Malmö.

TELEGRAPHIC ADDRESS: »ELECTROPROF».

THE firm was established in 1892. Its appearance signified a strong assertion of the leading principle that the work of a consulting engineer must be impartial and independent, unaffected by interests in deliveries, a principle which later on and during the course of years became very generally recognized. The work of the firm consists of the projecting of plants in connection with an investigation of the economical side of the question, the drawing up of programmes, drawings, and contracts of delivery, the controlling of the work, inspecting and testing. The firm was at first occupied with electric plants only but has since become extended so that to-day it carries out consulting work for mechanical and heating plants, as well as for steam plants, oil-, gas-, and hydraulic motors, rolling-plants, hoisting-plants, compressors etc. etc.

Among the plants projected by the firm may be mentioned the majority of Swedish Electric Works, many large power distribution works, in connection with which has been used the system with iron poles and long spans which is nowadays so common. Centrals for industrial works such as steam turbine centrals for permanent as well as for reserve purposes, for the supply of power and heat simultaneously in textile and cellulose factories etc. As also a great many transformer stations, motor-plants, illumination plants — of which many have been used for public buildings — lift-plants etc. etc.

The firm enjoys the advantage of special expert knowledge concerning electric cars and tramways and has executed several commissions in connection therewith.

Besides home clients the firm has been commissioned by clients in Finland and Canada. Up to date the firm has had 4,600 commissions on hand.

A.-B. VATTENBYGGNADSBYRÅN

(THE HYDRAULIC CONSTRUCTION BUREAU)

STOCKHOLM — SWEDEN.

SWEDEN'S great wealth of water courses, that can be used in the service of industry and for the purpose of communication, just as her long stretches of coast with their numerous harbours, provide all the natural conditions necessary for a very active and many-sided life for *hydraulic engineers.*

The Hydraulic Construction Bureau, the first and largest firm of consulting hydraulic engineers, has the advantage of existing among such suitable surroundings, where work abounds.

The firm's activity really commenced in the year 1897 when J. Gust. Richert, Civil Engineer, and afterwards professor in hydraulic engineering at the Technical High School of Stockholm, established himself in the capital as a consulting engineer for water constructions. Richert founded *The Hydraulic Construction Bureau* in 1902 together with some of his former assistants, among whom was the present managing director of the firm, Sven Lübeck, who also occupies the post of Secretary in Svenska Vattenkraftföreningen (The Swedish Water Power Association).

At the commencement of its career the firm was principally occupied with the working out of proposals for *Water Works and Drainage Systems* but it soon became extended to include other kinds of construction work, among which the *utilization of water-power* was the most important. To-day the bureau, generally styled VBB from the initial letters of its Swedish name, *carries on the work of consulting hydraulic engineers in all its branches,* consisting of *investigations, valuations,* the drawing up of *proposals,* and the *leading and controlling* of works in connection with power-plants, water-regulations, questions relating to water-law, water works, filtering-plants for drainage systems, canals, harbours, quays etc.

Among the various commissions in connection with power-plants that have been confided to and completed by the firm is one worthy of special mention, namely, the very comprehensive investigations into the possibilities for the electrification of the State Railways by utilizing the waterfalls belonging to the State in different parts of the country. The firm has also drawn up proposals for the water-power station in the river Dal on behalf of the City of Stockholm, and for the water-power station at Borås. In this connection it may be mentioned that VBB has rendered considerable assistance in planning and building the large constructions in the river Lagan on behalf of Sydsvenska Kraftaktiebolaget (The South Swedish Power Co. Ltd), in the rivers Mörrum and Helge for Hemsjö Kraftaktiebolaget (The Hemsjö Power Co. Ltd), and in the river Gullspång for Kraftaktiebolaget Gullspång—Munkfors (The Gullspång—Munkfors Power Co. Ltd), which supply a great many towns in the south of Sweden and the midlands with power and light.

Among the power-works at present under construction worthy of special mention are the large constructions at Norrforsen (on the river Ume), Krångedeforsarna (on the river Indal) and Lanforsen (on the river Dal). Projects have been drawn up for works in the neighbouring countries, namely, at Rjukanfors, Svælgfos, Vama, Tyir, Aura, Kinservik, and Otra in Norway, and Imatra in Finland, for the building of which investigations have recently been made on behalf of a commission of the Finnish Senate.

Lake and River Regulations are closely allied with the utilization of water-power, and the VBB have projected a great many such works. Many regulation works have been executed, and in many cases the VBB have assisted in bringing together the owners of works in the regulation associations.

Investigations into Water-Law questions of a technical nature is an important branch of the Bureau's work, as also *the construction of timber-floating ways and fish channels* in connection with water-power plants. When treating such questions the Bureau co-operates with experts. The firm has had great experience in the *formal treatment,* in the simplest and quickest manner, of water-power enterprises and lake regulations.

Thorough *hydrographic investigations* are an important factor in the projection of water-power plants. During the course of years the firm has gathered expert knowledge of the flow of water-courses in Sweden and the neighbouring countries.

The VBB has its own engineers' department for mechanical design, which principally works out proposals for the mechanical equipment etc. of power and pump stations; draws up specifications and carries out the testing of turbines.

The Water Works Department, as already mentioned, is the eldest branch of the firm and has planned water-works schemes for more than a 100 towns in Sweden. The method for artificial sub-soil-water, »the generation of sub-soil-water», which was used by Richert for the first time at Gothenburg, has become very widely spread and recognized for its merits all over the world.

If a sub-soil-water generation plant is to be successful it is perfectly clear that the *hydrographic investigation* must be arranged, carried-out and judged in the most rational manner possible. VBB has a very comprehensive experience in such work.

The consulting practice carried on by the firm in connection with water-works is completed by a similar consulting practice for drainage work. Even previous to the establishment of VBB Richert was awarded the Polhem Medal for a treatise entitled »Om kloakledningars dimensioner och lutningsförhållanden» (On the Dimensions and Sloping Conditions of Drain Pipes) and the scheme prepared by VBB for the international competition for the supplying of Petrograd with a canal system, was awarded with the only available prize.

A question touching drainage technique that has become more and prominent in Sweden during recent years is that in connection with *purification plants for drainage and waste water.* Many such plants have been constructed according to VBB's designs.

Among the various commissions concerning *navigation canals* that have been confided to and completed by VBB, the following are worthy of mention:

A scheme for a canal for deep-sea ships between the Baltic and Glan, with sluices and lift apparatuses alternatively.

A scheme for the re-construction of the Trollhätte Canal.

A scheme for a canal between Lake Vänern and the Cattegat, joining the sea at Uddevalla and deep enough for ships drawing 7 yds.

In the year 1905 VBB took part in an international competition in planning for the new Gothenburg harbour and were awarded the first prize.

During the 10 years the firm has been in existence about 1,400 commissions have been executed for the State, various Communities, and private persons.

The firm has always made a point of engaging engineers possessing the very best education and training, who with a thorough knowledge and careful treatment are able to unite practical technical experience with economy in the planning and execution of work committed to their charge. The number of engineers in the firm's service has, of course, varied according to the times within the limits of 15—40, there generally being 20—25.

The Water Works and Drainage Department is under the management of Professor *F. G. Richert* and Lieutenant *W. v. Greyerz* (during Captain *N. Westerberg's* absence). The Water Power Department is in the hands of Captain *Sven Lübeck*, Civil Engineer, assisted by Lieutenants C. *Schmidt* and *Mauritz Serrander*, and *Gottfried Berg*, Civil Engineer.

In the foregoing it will have been observed that the VBB have not limited their activity to Sweden alone, commissions having been received from the neighbouring countries of Norway, Finland, Russia and Poland. In the year 1909 *Die Schwedische-Russische Ingenieurgesellschaft* was founded for work in the two last-named countries. The manager of its office is *P. G. Hörnell*, Civil Engineer, who is one of the founders of the VBB and is well acquainted with the local conditions.

In conclusion it may be pointed out that among the various commissions coming from non-European countries the following are worthy of notice: the water works at Vladivostok, water-power investigations in Burmah, and the regulation of rivers in Kasai, and the Belgian Congo.

AKTIEBOLAGET NORRLANDSBANKEN

(THE NORTHERN BANK OF SWEDEN LTD)

SWEDEN.

HEAD OFFICE IN STOCKHOLM.

SHARE CAPITAL

KR. 19,050,500

RESERVE FUNDS ABOUT

KR. 10,300,000

HEAD OFFICE IN STOCKHOLM.

Correspondents in

NEW YORK:

NATIONAL CITY BANK.

KNAUTH, NACHOD & KÜHM.

CHICAGO:

FIRST NATIONAL BANK.

All kinds of Banking Business.

The largest Branch Office System of all Northern Banks.

5 BRANCHES IN STOCKHOLM.

46 BRANCHES IN THE PROVINCES AT THE FOLLOWING PLACES:

ÄLVDALEN, ÅSELE, AVESTA, BJÖRBO, BORLÄNGE, BURTRÄSK, DJURSHOLM, DOROTEA, EDSBYN, FALUN, FURUDAL, GAGNEF, GÄLLIVARE, GÄVLE, GRANGÄRDE, GRÄNGESBERG, HAPARANDA, HÄVERÖSUND, HEDEMORA, HEDESUNDA, JÄRVSÖ, KILAFORS, KIRUNA, KUNGSGÅRD, LEKSAND, LIMEDSFORSEN, LUDVIKA, LULEÅ, LYCKSELE, ÖREGRUND, ORSA, PITEÅ, RÄTTVK, RIMBO, SALA, SÄTER, SKÄRPLINGE, SKELLEFTEÅ, SKUTSKÄR, STORVIK, TÄRNSJÖ, TORSÅKER, UMEÅ, VANSBRO, VILHELMINA, VINDELN.

STOCKHOLM — SWEDEN

FIRE AND LIFE INSURANCES.
LIFE ANNUITIES.

SKANDINAVISKA KREDITAKTIEBOLAGET

(BANK ESTABLISHED 1864)

WITH WHICH IS AMALGAMATED SINCE THE YEAR 1910

SKÅNES ENSKILDA BANK

(ESTABLISHED 1830)

REGISTERED OFFICE AT GOTHENBURG.

STOCKHOLM, GOTHENBURG, MALMÖ. — SWEDEN.

TELEGRAPHIC ADDRESS: »KREDITBOLAGET».

BRANCHES: Norrköping, Helsingborg, Örebro, Lund, Halmstad, Landskrona, Kristianstad, Ystad, Trelleborg, Växjö, Karlshamn, Ängelholm, Sölvesborg, Simrishamn, Eslöf, Höganäs, Klippan, Svalöf, Löderup.

BALANCE SHEET, December 31st, 1913, after closing the Profit and Loss Account:

LIABILITIES.

	Kr.	Kr.
Capital paid up	45 430 060	
Reserve Fund	47 500 000	92 930 060: 00
Special Reserve		600 000: 00
Pension Fund		1 500 000: 00
Relief Fund		357 000: 00
Deposits		190 563 074: 11
Current Accounts		43 382 730: 18
Bank Post Bills in circulation		8 429 331: 80
Swedish Banks		3 501 032: 02
Foreign Banks		9 556 110: 37
Sundry Accounts		8 137 990: 28
Guarantees	6 649 700	
Dividend for the year 1913 (= 14.789 per cent.)		6 718 530: 00
Amount written off Premises Account		30 000: 00
Profit and Loss Account		615 941: 71
		Kr. 366 321 800: 47

ASSETS.

	Kr.
Cash	9 679 117: 33
Securities	26 255 085: 35
Loans on Securities	144 996 680: 13
Bills discounted (Swedish)	62 838 492: 04
„ „ (Foreign)	6 090 274: 79
Current Accounts secured	86 696 810: 96
Swedish Banks	1 337 685: 03
Foreign Banks	4 564 399: 19
Demand Bills and Foreign Money	4 014 254: 61
Sundry Accounts	9 098 296: 19
Bank Buildings	10 750 704: 85
Guarantees as per contra, Kr. 6 649 700.	
	Kr. 366 321 800: 47

Receives deposits of money at highest rates of interest;

Gives advice as to investment of capital and undertakes the administration of funds and private fortunes;

Collects bills and shipping documents;

Issues Circular Letters of Credit and acts as paying agents of Letters of Credit, Circular Notes, Money Orders and Travellers' Cheques;

Buys and sells foreign exchange;

Issues Swedish »Bank post bills» (postremiss) and buys and sells cheques and currency drafts on all important cities abroad;

Mail and Telegraphic Transfers effected;

Discounts bills of exchange;

Grants loans and credits on approved collateral;

Stock exchange business;

Receives securities and other deeds for safe custody and administration, and safe boxes let out;

Trusteeships accepted; *and general domestic and foreign banking business transacted.*

AKTIEBOLAGET
STOCKHOLMS DISKONTOBANK

(ESTABLISHED 1891)

HEAD OFFICE: STOCKHOLM (SWEDEN).

TELEGRAPHIC ADDRESS: »DISKONTOBANK».

CAPITAL FULLY PAID: KR. 10,000,000. — RESERVES: KR. 3,150,000.

BRANCHES: GAMLEBY, HULTSFRED, LILJEHOLMEN, MARIANNELUND, NORRTÄLJE, VIMMERBY, VÄDDÖ, VÄSTERVIK.

NEW YORK BANKER: NATIONAL CITY BANK OF NEW YORK.

LONDON BANKERS: LONDON COUNTY & WESTMINSTER BANK LTD., 82, Cornhill.
COMPTOIR NATIONAL D'ESCOMPTE DE PARIS.
THE BRITISH BANK OF NORTHERN COMMERCE, LTD.

Correspondents in all the principal cities of the world.

BALANCE SHEET, 31st October 1914.

LIABILITIES:			ASSETS:		
Capital fully paid	Kr.	10,000,000: —	Cash in hand	Kr.	600,253: 26
Reserves	»	3,150,000: —	Due from Swedish Banks	»	107,200: —
Deposits & Current Accounts	»	28,996,677: 31	Due from Banks abroad	»	391,994: 65
Bills in Circulation	»	247,567: 22	Governments & other bonds	»	3,121,238: —
Due to Swedish Banks	»	900,000: —	Bills discounted	»	11,164,124: 41
Due to Banks Abroad	»	432,557: 97	Loans	»	23,175,135: 97
Sundry Accounts	»	1,355,721: 59	Current Accounts	»	4,430,536: 79
			Bank buildings	»	1,350,000: —
			Sundry accounts	»	742,041: 01
	Kronor	45,082,524: 09		Kronor	45,082,524: 09

Deposits received for fixed periods or at notice on the most favorable terms.

Accounts opened for foreign correspondents.

Collections and payments in all accessible points of Scandinavia through direct Banking Connections upon terms to be ascertained at the office.

Special attention to collection against and payments in exchange for Shipping Documents on Scandinavian places.

Executor & Trustee Business undertaken.

General foreign Banking Business transacted.

STOCKHOLMS ENSKILDA BANK

STOCKHOLM, SWEDEN

BANK WITH UNLIMITED LIABILITY OF THE SHAREHOLDERS. ESTABLISHED IN 1856.

FUNDS..... KR. 52,000,000.

TELEGRAPHIC ADDRESS: NITTON, STOCKHOLM.

BANKING AND EXCHANGE BUSINESS OF EVERY DESCRIPTION. BILLS NEGOTIATED OR FORWARDED FOR COLLECTION. REMITTANCES MADE BY TELEGRAPHIC TRANSFER. BONDS AND STOCKS BOUGHT AND SOLD. DEPOSITS RECEIVED FOR FIXED PERIODS OR AT NOTICE. STOCKS AND BONDS RECEIVED FOR SAFE CUSTODY AND GENERAL ATTENTION.

AKTIEBOLAGET
STOCKHOLMS HANDELSBANK

(THE STOCKHOLMER COMMERCIAL BANK LTD.)

ESTABLISHED 1871. AMALGAMATED 1914 WITH BANKAKTIEBOLAGET NORRA SVERIGE

CAPITAL PAID UP AND RESERVE FUNDS ABOUT KR. 65 000 000.

HEAD OFFICE: STOCKHOLM, SWEDEN. TEL. ADDRESS: »HANDELSBANK, STOCKHOLM».

BRANCHES:

BODEN	LJUSNE	SANDVIKEN
BOLLNÄS	LUGNVIK	SKELLEFTEÅ
BOMHUS	LULEÅ	SOLLEFTEÅ
BORENSBERG	LÖFÅNGER	STRÖMSUND
BREDBYN	MALMBERGET	SUNDBYBERG
GEFLE	MOTALA	SUNDSVALL
HAPARANDA	NEDERKALIX	SÖDERHAMN
HEBY	NJURUNDA	TIERP
HERNÖSAND	NORDMALING	TÄRNSJÖ
HORNDAL	NYLAND	ULLÅNGER
JUNSELE	NYNÄSHAMN	UPSALA
KRAMFORS	PITEÅ	ÖFVERTORNEÅ
KRISTINEHAMN	RAMSELE	ÖREBRO
KÖPING	ROBERTSFORS	ÖRNSKÖLDSVIK

THE BANKING DEPARTMENT transacts all kinds of banking business.

THE NOTARIAL DEPARTMENT receives under the Bank's full guarantee Stocks, Bonds, and all kinds of deeds and documents for safe custody and general attention, assists in drawing up legal documents, etc.

THE STOCK DEPARTMENT buys and sells all sorts of Bonds and Shares.

Best connections with the Swedish export industries.

Correspondents all over the World.

Swedish-Americans and others wishing to invest money in Swedish undertakings will find no better guardian of their interests than the Notarial Department.

SUNDSVALLS ENSKILDA BANK

(THE SUNDSVALL PRIVATE BANK)

UNLIMITED LIABILITY COMPANY. ESTABLISHED 1864.

SWEDEN.

HEAD OFFICE: SUNDSVALL.

STOCKHOLM OFFICE: 4, FREDSGATAN.

BRANCHES AT ÖSTERSUND, HERNÖSAND, ÖRNSKÖLDSVIK, SOLLEFTEÅ HUDIKSVALL, LJUSDAL, ÅNGE, AND NJURUNDA.

CAPITAL PAID UP ..... KR. 10,250,000

RESERVE ..... » 12,750,000

EVERY DESCRIPTION OF BANKING BUSINESS TRANSACTED.

Deposits received for fixed periods at best market rates.
Cheque Accounts free of commission.
Credits opened on Current Account.
Documentary Credits granted.
Bills negotiated.
Loans granted.
Collections undertaken on all banking places throughout the world.
Remittances effected by letter or cable.
Cheques and Letters of Credit issued on all parts of the world.
Purchase and Sale of Stocks & Shares effected.
Strong Room accommodation.
Safe Custody.
Executor and Trustee Business undertaken.

SVEA

Fire and Life Insurance Company

of GOTHENBURG, SWEDEN.

ORGANIZED 1866.

Among the Fire Insurance Companies of Sweden, Norway and Denmark ***Svea*** is the ***only*** company, which, duly licensed, carries on a direct business in the United States of America.

Svea has more than 1,200 agents in cities and towns all over the United States of America.

Svea has paid as indemnification in consequence of losses by fire $ 47,038,363: 91.

Total Assets (Dec. 31st 1913)	$ 14,547,290: 11
Subscribed capital	$ 2,666,666: 67
Paid up capital	$ 800,000: 00
Surplus in regard to policyholders	$ 2,104,920: 98

United States Branch.

Trustee: The New York Trust Company.

Departments:

Eastern & Western: Head Office New York, 100 William Street,
M. L. Duncan, U. S. Manager.

Pacific Coast: Head Office San Francisco, 202 Sansome Street,
Edward Brown & Sons, Managers.

Southern: Branch Office Atlanta, Ga.
Rhett & O'Beirne, General Agents.

Branch Office Raleigh, N. C.
Hay Bros. & Reynolds, Managers.

Assets in the United States (Dec. 31st 1913)	$ 1,518,749: 80
Total Liabilities in the United States	$ 847,475: 65
Surplus in the United States	$ 671,274: 15

AKTIEBOLAGET
SVERIGES PRIVATA CENTRALBANK

STOCKHOLM SWEDEN

CAPITAL

Kr. 5,000,000

SURPLUS

Kr. 2,900,000

THE Bank was founded in 1912 by a great number of old Swedish banks, chiefly operating in the provinces, in order to take care of and develop the mutual interests of these banks and to act as their Stockholm representatives.

The Bank transacts every kind of Banking business. It undertakes payments and collections on all places in Sweden, for which it is especially qualified, the banks interested having branches in about 200 Swedish places.

Deposits in the Centralbanken or in anyone of the Banks mentioned on the other side can be made either through remitting check in dollars or crowns to CENTRALBANKEN, STOCKHOLM, or through payment for account of the Centralbanken to the *National City Bank of New York, New York.*

Commissions are executed and inquiries are replied to with the greatest readiness. Write or telegraph only to

CENTRALBANKEN, STOCKHOLM.

(Continued next Page!)

AKTIEBOLAGET SVERIGES PRIVATA CENTRALBANK

STOCKHOLM.

Represents the following Swedish banks which are its sole shareholders:

	Year established	Capital & surplus	Balance October 31st 1914
Aktiebolaget Mälareprovinsernas Bank.....	1901	29,200,000	106,984,226
Aktiebolaget Norrlandsbanken	1911	29,250,750	122,221,373
Aktiebolaget Skånska Handelsbanken	1896	21,200,000	107,632,962
Bankaktiebolaget Södra Sverige	1901	30,200,000	137,696,231
Borås Enskilda Bank	1865	7,050,000	26,375,817
Helsinglands Enskilda Bank	1873	10,250,000	48,493,463
Kopparbergs Enskilda Bank	1835	10,250,000	50,958,441
Norrköpings Enskilda Bank	1856	9,000,000	30,332,031
Södermanlands Enskilda Bank	1865	11,000,000	43,356,117
Uplands Enskilda Bank	1864	10,601,221	50,479,159
Wermlands Enskilda Bank	1832	23,675,000	128,387,968
Örebro Enskilda Bank	1837	6,600,000	34,222,180
Östergötlands Enskilda Bank.....	1837	8,500,000	48,632,238

SYDSVENSKA KREDIT AKTIEBOLAGET

HEAD-OFFICE: MALMÖ.

STOCKHOLM, GOTHENBURG. — SWEDEN.

SHARE CAPITAL: Kr. 16,000,000. — RESERVE FUNDS: Kr. 5,800,000.

BRANCHES AND CORRESPONDENTS ALL OVER SWEDEN.

BANKING BUSINESS OF EVERY DESCRIPTION.

Acts as redemption-office for TRAVELLERS' CHEQUES and CIRCULAR LETTERS OF CREDIT.

Effectuates MONEY-ORDERS.

Arranges for American banks to draw UNLIMITED and LIMITED DRAFTS on Sweden.

Receives BILLS FOR COLLECTION.

Correspondence solicited with American banks. Write for collection-tariff and list of Correspondents.

The bank was established in 1896, and its business has developed as follows:

	DEPOSITS	SUM TOTAL
31st Dec. 1896	Kr. 742 059: 13	Kr. 4 143 197: 90
31st » 1906	» 42 861 999: 01	» 71 516 920: 37
31st » 1913	» 78 694 862: 27	» 118 862 762: 15
30th Nov. 1914	» 86 908 875: 41	» 131 450 094: 46

BANKAKTIEBOLAGET SÖDRA SVERIGE

THE SOUTH OF SWEDEN BANKING Co., LTD.

PAID UP CAPITAL KR. 20 000 000 (ABOUT $ 5 400 000). SURPLUS KR. 10 200 000 (ABOUT $ 2 700 000).

UNDER THE CONTROL OF THE SWEDISH GOVERNMENT.

HEAD OFFICE: HELSINGBORG, SWEDEN.

BRANCHES: at Stockholm, Gothenburg, Malmö, and the following 37 places in Sweden:

Borgholm	Karlskrona	Ousby	Vestervik
Elmhult	Klintehamn	Ronneby	Vimmerby
Emmaboda	Kristianstad	Skurup	Virserum
Eslöf	Limhamn	Slite	Visby
Hemse	Lund	Säfsjö	Vislanda
Hessleholm	Mönsterås	Tidaholm	Visseijerda
Högsby	Mörbylånga	Tingsryd	Ystad
Jönköping	Nybro	Torsås	Åhus
Kalmar	Oskarshamn	Valdemarsvik	Åsheda.
Karlshamn			

Current accounts opened on the most favourable terms.

MONEY received on DEPOSIT at the highest rate of interest.

Money may be paid in or remitted for our account to our American Correspondents:

The Mechanics & Metals National Bank, New York,
The National City Bank of New York, New York,
The First National Bank of Chicago, Chicago, Ill.,
The Crocker National Bank of San Francisco, San Francisco, Cal.

and the equivalent will be credited at the best rate of exchange of the day.

LETTERS OF CREDIT issued.

MAIL & CABLE TRANSFERS effected.

BILLS OF EXCHANGE collected on the cheapest terms.

Every other description of banking business transacted.

The Bank is enabled through its large number of Branches and special Correspondents to offer unexcelled service throughout Sweden and the other Scandinavian Countries.

Confidential reports regarding Scandinavian firms supplied to clients.

Our AMERICAN DEPARTMENT will be pleased to give any information required.

SANDSTRÖM, STRANNE & Co. LTD.

STEAMSHIP BROKERS & CHARTERING AGENTS.

FORWARDING & INSURANCE AGENTS.

GOTHENBURG. — SWEDEN.

TELEGRAPHIC ADDRESS: »SANDIS GOTHENBURG».

General Agents for Sweden for THE SWEDISH AMERICA MEXICO LINE LTD & THE NORWAY MEXICO GULF LINE LTD. Regular monthly steamers: *Gothenburg—U. S. A., Mexico & Cuba* & vice versa.

Agents for THE EAST ASIATIC CO. LTD, Copenhagen. BANGKOK LINE. Regular steamers to: *Port Said—Colombo—Penang—Singapore & Bangkok.*

WEST INDIA LINE. Regular steamers to: *St. Thomas—Antigua—Dominica—St. Lucia—Barbados—Trinidad—Demerara & Paramaribo.*

RIGA LINE. STOCKHOLM STEAMSHIP CO. SVEA LTD, Stockholm. Regular weekly steamers: *Gothenburg—Riga* & vice versa.

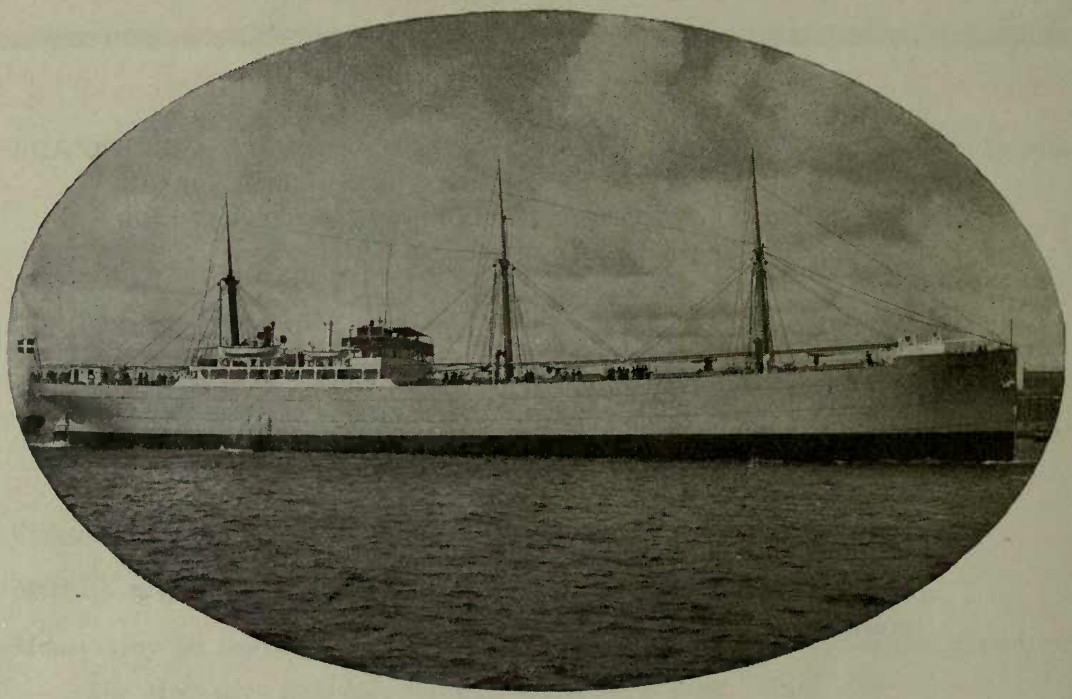
THE EAST ASIATIC CO. LTD, Copenhagen. PACIFIC LINE. Regular steamers to: *San Francisco* (Cal.), *Portland* (Ore.) *& Vancouver* (B. C.) also calling at: *San Pedro* (Cal.), *Oakland* (Cal.), *Tacoma* (Wash.), *Seattle* (Wash.) *& Victoria* (B. C.).

SCANDINAVIAN EAST-AFRICA LINE (THOR THORESEN JR.). Regular steamers every second month: *Gothenburg—Red Sea—East Africa & Madagascar.*

REDERIAKTIEBOLAGET NORDSTJERNAN

JOHNSON LINE

STOCKHOLM



M. S. PACIFIC

FLEET:

MOTORSHIPS:

Suecia . . . . . 6550 d. w.	Kronprins Gustaf Adolf . 6550 d. w.	Pacific . . . . . 6550 d. w.
Pedro Christophersen . . 6550 »	Kronprinsessan Margareta 6550 »	Building . . . . . 6550 »

STEAMERS:

Kronprins Gustaf . . . 7500 d. w.	Kronprinsessan Victoria . 6100 d. w.	Thai . . . . . 2225 d. w.
Drottning Sophia . . . 7500 »	Prinsessan Ingeborg . . 6100 »	Avesta . . . . . 2225 »
Oscar Fredrik . . . . 6400 »	Oscar II . . . . . 5650 »	Margaret . . . . . 2150 »
Axel Johnson . . . . 6370 »	Reserv . . . . . 2580 »	Nordstjernan . . . . . 1850 »
Annie Johnson . . . . 6370 »		Annie Therese . . . . 1225 »

DIRECT REGULAR SERVICES:

Sweden & Norway — North Pacific via Panama
and vice versa

Sweden & Norway — Chile
and vice versa

Sweden & Norway — Brazils
and vice versa

Sweden & Norway — River Plate
and vice versa

AGENTS:

San Fransisco W. R. Grace & Co.	*Pernambuco* Griffith-Williams & Johnson Ltd.	*Santos* . . . Schmidt, Trost & Co.
Valparaiso W. R. Grace & Co.	*Rio de Janeiro* Luiz Campos	*Buenos Aires* W. Allinson Bell

REDERIAKTIEBOLAGET NORDSTJERNAN

JOHNSON LINE

STOCKHOLM

DIRECT REGULAR SERVICE

SWEDEN & NORWAY — NORTH PACIFIC

and vice versa via Panama.

MONTHLY SAILINGS BY MOTORSHIPS TO

SAN FRANSISCO, OAKLAND, SAN DIEGO, SAN PEDRO (LOS ANGELES), (CAL.), PORTLAND (ORE.), VICTORIA, VANCOUVER (B. C.), TACOMA, SEATTLE (WASH).

GOODS TAKEN ON THROUGH RATES FOR TRANSHIPMENT AT

Cristobal (Colón):

PANAMA:	Colón, Bocas del Toro.
BRITISH HONDURAS:	Belize.
HONDURAS:	Puerto Cortez.
COSTA RICA:	Puerto Limón.
GUATEMALA:	Puerto Barrios, Livingston, San Juan del Norte, Stauncreek.
NICARAGUA:	Bluefields.
SANTO DOMINGO:	Puerto Plata, Sanchez, Samaná, Monte Cristy, San Pedro de Macoris, Azua, Domingo City, La Romana.
JAMAICA:	Kingston, Jamaica outports.
HAITI:	Cap Haiti, Port de Paix, Gonaives, St. Marc, Port-au-Prince, Petit Goave, Miragoana, Jeremie, Aux Cayes, Jacmel.
COLUMBIA:	Cartagena, Calamar, Puerto Columbia, Baranquilla.
VENEZUELA:	La Guayra, Puerto Cabello, Carúpano Cumaná, Guanta, Pampatar, Maracaibo, La Vela de Coro, Curaçao, Aruba, Bonaire, Trinidad, Ciudad Bolivar.
GUIANA:	Demerara, Paramaribo, Sinnamarie.

Balboa (Panama):

West Coast of Central America:

COSTA RICA:	Punta Arenas.
NICARAGUA:	San Juan del Sur, Corinto.
HONDURAS:	Amapala.
SALVADOR:	La Union, La Libertad, Acajutla.
GUATEMALA:	San José de Guatemala, Champericos, Ocós.

West Coast of Mexico:

Acapulco, Manzanillo, San Blas, Mazatlan, Puerto Angel, Tonalá, Altata, Guaymas, La Paz.

West Coast of South America:

COLUMBIA:	Buenaventura, Tumaco.
ECUADOR:	Esmeraldas, Bahia, Manta, Puerto Bolivar, Guayaquil.
PERU:	Eten, Payta, Pacasmayo, Salaverry, Pisco, Callao, Ilo, Mollendo, Huanchaco, Supé, Chimbote, Samanco, Casma, Huarmey, Huacho, Lomas, Chala, Cerro Azul, Tambo de Mora.
CHILE:	Arica, Pisagua, Tocopilla.

HEAD AGENTS: **W. R. GRACE & Co.,** SAN FRANSISCO

SWEDISH EAST-ASIATIC COMPANY, LTD.
SWEDISH AMERICA MEXICO LINE, LTD.
MGR.: DAN BROSTRÖM.
SWEDISH LEVANT-LINE, DAN BROSTRÖM.
GOTHENBURG (SWEDEN).

The SWEDISH EAST ASIATIC COMPANY maintains a regular *fortnightly* service between SCANDINAVIA and STRAITS, CHINA & JAPAN, and a *monthly* service between SCANDINAVIA and INDIA & BURMAH.

The SWEDISH AMERICA MEXICO LINE maintains a regular *monthly* service between GOTHENBURG and NEWPORT NEWS, TAMPICO, VERA CRUZ, GALVESTON & NEW ORLEANS, and a *monthly* service between GOTHENBURG and BOSTON, NEW YORK & PHILADELPHIA.

The SWEDISH LEVANT-LINE maintains a regular *monthly* service between GOTHENBURG and ALGER, PIRÆUS, SALONIKI, SMYRNA, CONSTANTINOPLE & ODESSA.

ALBERT BONNIER PUBLISHING HOUSE.

561 THIRD AVE., NEW YORK.

INTEREST in Scandinavian Culture in general, and Scandinavian literature in particular has enormously increased during recent years. This increase has been seen in various ways and in proportion therewith the demand has extended too. There has been such a remarkably increased demand that *one* single place in America required, without delay, all Swedish, Danish and Norwegian literature that could possibly be obtained, and also scientific and second-hand books, and information of all kinds touching Scandinavian literature.

Many attempts have been made to establish what may be called a "centre for Scandinavian books" but they failed owing to unforsee expenses, heavy freights and sale difficulties, but above all on account of the fact that American libraries showed too little interest in Scandinavian literature.

When the firm *Albert Bonnier Publishing House* was started some few years ago it was chiefly with a view of procuring special departments for Scandinavian books in the public libraries of such communities where large numbers of Scandinavians resided.

The Albert Bonnier Publishing House, after having expended large sums of money, has at last been successful in attracting sufficient interest in the matter and the firm believes that, by making Scandinavian literature easily obtainable and inexpensive, it has contributed to strengthen the bonds of union between Scandinavians in America and the mother country.

The Albert Bonnier Publishing House also endeavours to awaken and maintain the interest of the *American public* in Scandinavian Art by keeping a constant stock of beautiful reproductions of the works of celebrated Scandinavian painters.

Finally it should be mentioned that the firm has always business directories and reference books in stock for such firms as desire to increase their commercial connections with Sweden, Norway and Denmark.

AKTIEBOLAGET
SVERIGES LITOGRAFISKA TRYCKERIER

(LITHOGRAPHIC PRINTING COMPANY)

STOCKHOLM — SWEDEN.

TELEGRAPHIC ADDRESS: "ESSELTE".

ESTABLISHED 1913.

SHARE CAPITAL (paid up) ..... Kr. **15,650,000**

FACTORIES AND DEPARTMENTS FOR:

LITHOGRAPHIC PRINTING.
TYPOGRAPHIC PRINTING.
INTAGLIO-PRINTING (Copper and Steel).
ROTOGRAVURE-PRINTING.
PHOTOTYPE-PRINTING.
BOOKBINDING.
OFFICE BOOKS.
FANCY BOXES.
CARDBOARD BOXES.
ENVELOPES.
PAPERBAGS.
FANCY PAPERBAGS.
RELIEF PRESSING.
FANCY PAPERSTAMPING.
PLAYING-CARDS.
PHOTO-ENGRAVING.
RUBBER STAMPS.
FANCY TIN-CANS.

ANNUAL MANUFACTURE ..... Kr. **10,000,000**

HANDS EMPLOYED **3,500**.

STOCKHOLMS ADRESSKALENDER

(THE STOCKHOLM DIRECTORY)

THE Stockholm Directory was first published in 1855 by P. A. Huldberg, bookseller.

Since the year 1894 it has been published by "Centraltryckeriet" at Stockholm, and during the intervening years has been considerably improved and extended.

It is published each December and contains about 1,500 pages. It gives the names of the inhabitants of Stockholm and suburbs in a Name Register arranged in alphabetical order, as well as a Street Register.

The directory contains a complete register of all estates with the names of the owners, ground space, value of fire insurance and the taxation value. On account of its accuracy this register has come to be regarded as an authority and is now commonly used in transacting estate business.

For the further adance of mercantile and industrial interests The Stockholm Directory has also a trade index containing under their respective headings the tradesmen of the town, artisans and industries. In connection with this register the directory possesses a comprehensive advertisement part which makes it a very suitable advertising organ for all branches.

The directory costs 10 Kronor.

A. B. CENTRALTRYCKERIET

I STOCKHOLM

(THE CENTRAL PRINTING OFFICE)

ESTABLISHED 1874.

AMALGAMATED WITH A.-B. SVERIGES LITOGRAFISKA TRYCKERIER (THE SWEDISH LITHOGRAPHIC PRINTING CO. LTD) SINCE 1913.

A magnificent factory-building was erected for the printing office facing Vasagatan opposite the Central Railway Station in one of the principal thoroughfares of the city. This excellent position has undoubtedly tended considerably to direct the Company's attention especially to first-class printing for the commercial world.

The following kinds of printing are carried on by the Company.

BOOK PRINTING DEPARTMENT for books and illustrated works, catalogues and mercantile printing.

About 40 different weekly periodicals and journals are printed out by the Company.

LITHOGRAPHIC DEPARTMENT for art printing, multi-colour work, music-books, transfers and mercantile work.

DIE STAMPING.

PARAGON DEPARTMENT for check books, duplicating and triplicating books.

RUBBER STAMP WORKS.

Owing to purchases and extensions made during the course of time the Company's estates now cover a space of 5,800 sq. m. The firm employs 450 hands and possesses some 90 printing presses driven by electric power.

The annual turnover is about $2^{1}/_{4}$ million Kronor.

MJÖLKNINGSMASKINEN COMOR

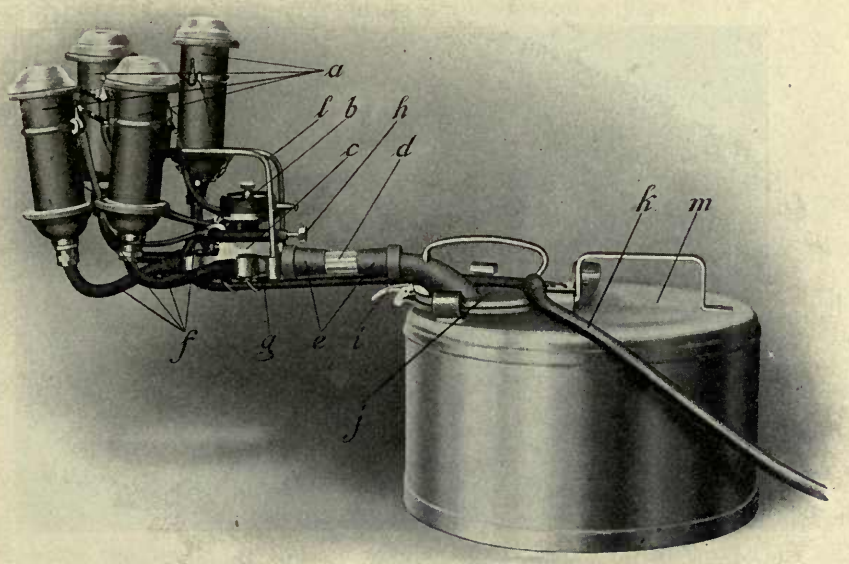
»THE COMOR MILKER»

STOCKHOLM.

TELEGRAPHIC ADDRESS: MILKCOMOR.

THE COMOR MILKING MACHINE COMPANY was started in 1914 in order to manufacture and place on the markets of the civilized world the very latest invention in milking machines, the COMOR, patented in nineteen countries. This novelty is constructed on the principle of suction and pressure, this principle having proved the sole admitting the solution of the problem of milking by machinery.

The appearance of COMOR has satisfactorily solved this problem as COMOR *is the type of a perfect milking machine both technically and practically.* In construction it is



THE COMOR MILK MACHINE.

a = dug-cups.
b = pulsator.
c = branched pipe.
d = celluloid milk-pipe.
e = conical screwing arrangement for the milk-pipe.
f = milk-tubes.
g = vacuum tube from the pulsator to main conduit.
h = screw for regulating speed.
i = locking arrangement for fastening the lid to milk-receiver.
j = lid.
k = main tube.
l = support for keeping the dug-cups upright.
m = milk-pail.

wonderfully simple, having few parts that are all easily accessible for cleaning purposes and control.

After but a couple of demostrations anyone can at once manage the machine. The cows stand the milking by machine far better than being milked by hand. The due emptying of the udder and dugs is perfectly satisfactory and equals that of the best hand-milking. *A young person can easily manage 4 to 5 machines at one time, and milk from 35 to 40 cows per hour.*

Thus by using a Comor one person can do more milking than is otherwise accomplished by four. This is certainly economy.

From a hygienic point of view milking with a Comor is so essentially superior to milking by hand that no comparison is necessary. On bacteriological examination scientifically executed it has been proved that milk drawn by the Comor keeps 3 to 4 times longer than other milk, and is in far higher degree free from particles of dirt. Among specialists, the idea is gaining ground that Comor is the milking machine of the future. The firm will gladly reply to all enquiries regarding the milking machine, and if the number of cows be stated, will give an estimate of expense. For their world-wide export the Company needs suitable agents and representatives everywhere. For further particulars apply to the manufacturers

MJÖLKNINGSMASKINEN COMOR, STOCKHOLM, SWEDEN.

FOUR »COMOR»-MACHINES WORKING AT THE SAME TIME.

THE SWEDISH SOCIETY FOR THE PRESERVATION OF LIFE FROM SHIPWRECK

(SVENSKA SÄLLSKAPET FÖR RÄDDNING AF SKEPPSBRUTNE)

FOUNDED IN 1907 WITH A VIEW TO PROVIDE FOR THE ESTABLISHMENT AND SUSTENTATION OF LIFE-SAVING-STATIONS ON THE SWEDISH COAST.

THE Society has at present ten life-boat-stations. Four of these are stationed at the coast of Halland, one at Hoburg on the Isle of Gotland and one on Gotska Sandön; these six being provided with row-life-boats and rocket-apparatus. The other four stations are provided with big, decked motor-boats. Three of them are stationed in Upland and one on the Isle of Öland.

A station equipped with a row-life-boat costs about $ 4,000 and with a motor-boat $ 8,000. The working expenses for a station amount to about $ 400 a year.

All crews are voluntary.

The yearly income of the Society is now about $ 9,500, this sum being the annual amount of subscriptions from 5,000 members and various voluntary contributions and donations.

The regular annual subscription for members is only 75 cents (3 Kronor). Permanent membership will be obtained by the contribution of $ 55 (200 Kronor).

Everybody and particularly Swedish-Americans are heartily invited to become members and thereby promote the work for the Society to the welfare of all sea-faring nations.

Any contributions or member's fees should be sent by postal order and addressed to SVENSKA SÄLLSKAPET FÖR RÄDDNING AF SKEPPSBRUTNE, *Gothenburg, Sweden.*

SWEDISH ART

IS EXHIBITED IN

THE PALACE OF FINE ARTS.

SPECIAL CATALOGUE.

INDEX

LIST OF EXHIBITORS.

LIST OF ILLUSTRATIONS.

CLASSIFIED LIST OF ADVERTISEMENTS.